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Modeling Subsistence Change in the Late Prehistoric Period in the Interior Lower Coastal Plain of South Carolina

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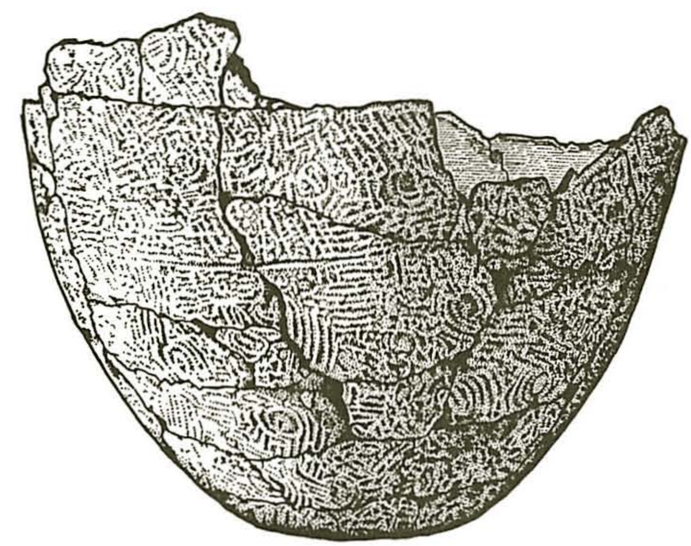

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ABSTRACT

Recent research on Middle-Late Woodland and Mississippian subsistence-settlement change has modified substantially the traditional models of late fall, coastal to interior transhumance patterns along the southeastern Atlantic Coast. The archeological, ethnohistorical, and environmental data suggest that the interior Lower Coastal Plain of South Carolina was exploited on a year-round basis during the late prehistoric period. These data and those recovered from two archeological sites, which were investigated by the Institute of Archeology and Anthropology for the U.S. Army Corps of Engineers' Cooper River Rediversion Project, indicate differences in the subsistence strategies between the Middle-Late Woodland and Mississippian populations, however. The Middle-Late Woodland settlement pattern appears to reflect generalized exploitation of riverine and interriverine resources, whereas the Mississippian exploitation strategy apparently focuses on the intensive exploitation of a relatively narrow range of specific, high density, riverine resources. A series of interrelated hypotheses, deduced from economic ecological theory, characterizes the expected nature of these differences. The hypotheses are tested using paleoecological data and deriving archeological measures of functional variability for the artifact assemblages recovered from sites 38BK235 and 38BK236 located in the riverine zone. The results support intensive exploitation of the interior riverine zone in the summer and early fall by both Middle-Late Woodland and Mississippian groups, with the Mississippian occupation having more and better defined activity areas and showing a greater range of diversity and functional specificity in the artifact assemblage.

Authorship of the Manuscript

A number of people authored various sections of this report. Mark J. Brooks and Veletta Canouts wrote Chapters 1, 2, 3 and 7. Veletta Canouts, Helen W. Haskell and JoLee A. Pearson wrote Chapter 4. Keith M. Derting and Mark J. Brooks wrote Chapter 5. William H. Marquardt and Veletta Canouts co-authored Chapter 6.

ACKNOWLEDGMENTS

A number of dedicated individuals cooperated to enhance the quality of the field investigations and the final report. Their efforts are gratefully acknowledged. A core of crew and staff, toiling alike under the hot Carolina sun, remained upright for a crew picture.

Standing from left to right: Mark Brooks, Tommy Charles, LeBarre Blackman, JoLee Pearson, Kathy Dukes, Claude (Bud) Cupp, Hank Bruno, Michael Harmon, Jim (Cubby) Sexton, and Joe Joseph. Paul Brockington is center front.

Uncounted numbers of individuals, conscripted for a day or week, also gave invaluable assistance. Lou Iacona of the U.S. Army Corps of Engineers, Charleston District, provided use of on-site facilities for a laboratory. Captain Bell and Bob Lawson responded to our needs with alacrity and good humor. Archeological liaison personnel from the Corps of Engineers' South Atlantic Division, Marc Rucker, and from the National Park Service, Southeast Regional Office, Bennie Keel, Jim Thomson, Marcy Gray, and Wilfred Husted, monitored our progress. Leland Ferguson, Ronald Bishop, Marion Smith, Major McCollough, Charles Faulkner, Albert Goodyear, and William

Marquardt reviewed various drafts of this manuscript. Their comments, thoughtfully expressed, were greatly appreciated. The culmulative talent and effort that the entire Institute staff has brought to bear on problems in South Carolina prehistory are also recognized, both personally and in the referenced works. A special thank you is extended to Tim White and Alan May who assisted Jim Sexton with the computer programming. Technical assistance in the preparation of this report was provided by Gordon Brown, photographer; Darby Erd, draftsman; Kenn Pinson, editorial assistant, and Linda Edwards, student editorial assistant; and Mary Joyce Burns, Word Processor Operator.

After an approximately two-year hiatus, from June 1982 to September 1984, during which there were no further developments with the Cooper River Project, this contract and this product were brought to a conclusion in July, August, and September 1984 under the new South Carolina Institute's Director Bruce Rippeteau, and by Kenn Pinson, who assembled and edited the earlier manuscripts into this final report.

CHAPTER 1

INTRODUCTION

Under contract with the National Park Service, Southeast Regional Office, Interagency Archeological Services Division, the Institute of Archeology and Anthropology, University of South Carolina, Columbia, carried out intensive archeological investigations and analyses between 1979 and 1981 for the Cooper River Rediversion Project, sponsored by the U.S. Army Corps of Engineers, Charleston District. Located on the interior Lower Coastal Plain in Berkeley County, South Carolina, the rediversion canal extends from the northeastern edge of Lake Moultrie across approximately 16 km of interriverine upland and swamp to the Santee River (Fig. 1). The purpose of the project is to curtail the excessive sedimentation in Charleston Harbor by rediverting the water now flowing from Lake Moultrie into the Cooper River back to its original course in the Santee.

Situated 50 km inland, the project area exhibits a mosaic of forested upland (oak-hickory/southern pine) and swamp (cypress/gum/tupelo) ecological communities. Soils throughout the area are usually poorly drained; the elevation reaches no more than 25 m between the Cooper and Santee River drainages. A mild climate, featuring long summers, with heavy rains and temperatures above 28° C, and short, dry winters with temperatures above 5° C, has proved conducive to the area's long agricultural use. Migratory waterfowl, fish, and deer continue to thrive in the area today.

The Institute had a long history of involvement in the cultural resource management planning for this project. An initial reconnaissance survey was first undertaken by the Institute in 1974 (Asreen 1974). After changing the design of the rediversion canal, the Corps of Engineers again contracted with the Institute in 1977 to perform a more intensive survey and detailed level of assessment for sites that would be affected by the design changes (Brockington 1980). These surveys indicated that a number of large, multicomponent archeological sites existed in the ecotone between the upland flatwoods and the Santee Swamp (Figs. 1 and 2).

The National Park Service coordinated a large, multi-organizational effort to excavate and analyze Archaic, Woodland, Mississippian, and Historic period sites. Of the 10 sites Brockington (1980: 99) recommended for further study, the Institute's primary responsibility for the final mitigative phase focused on sites 38BK235, 38BK236, and 38BK239; site 38BK423 was added later (Fig. 3). All four of these sites had prominent Middle-Late Woodland components. Site 38BK235 also had a major Mississippian component that was not discovered until the testing phase. Three sites with strong showings of earlier components, i.e., Middle and Late Archaic, as well as later Woodland components, were excavated by Commonwealth Associates, Inc., under the direction of David G. Anderson (Anderson, Novick, and Cantley 1982) and two historic plantation components, by Soil Systems, Inc. under the direction of Patrick H. Garrow (Wheaton, Friedlander and Garrow 1983).

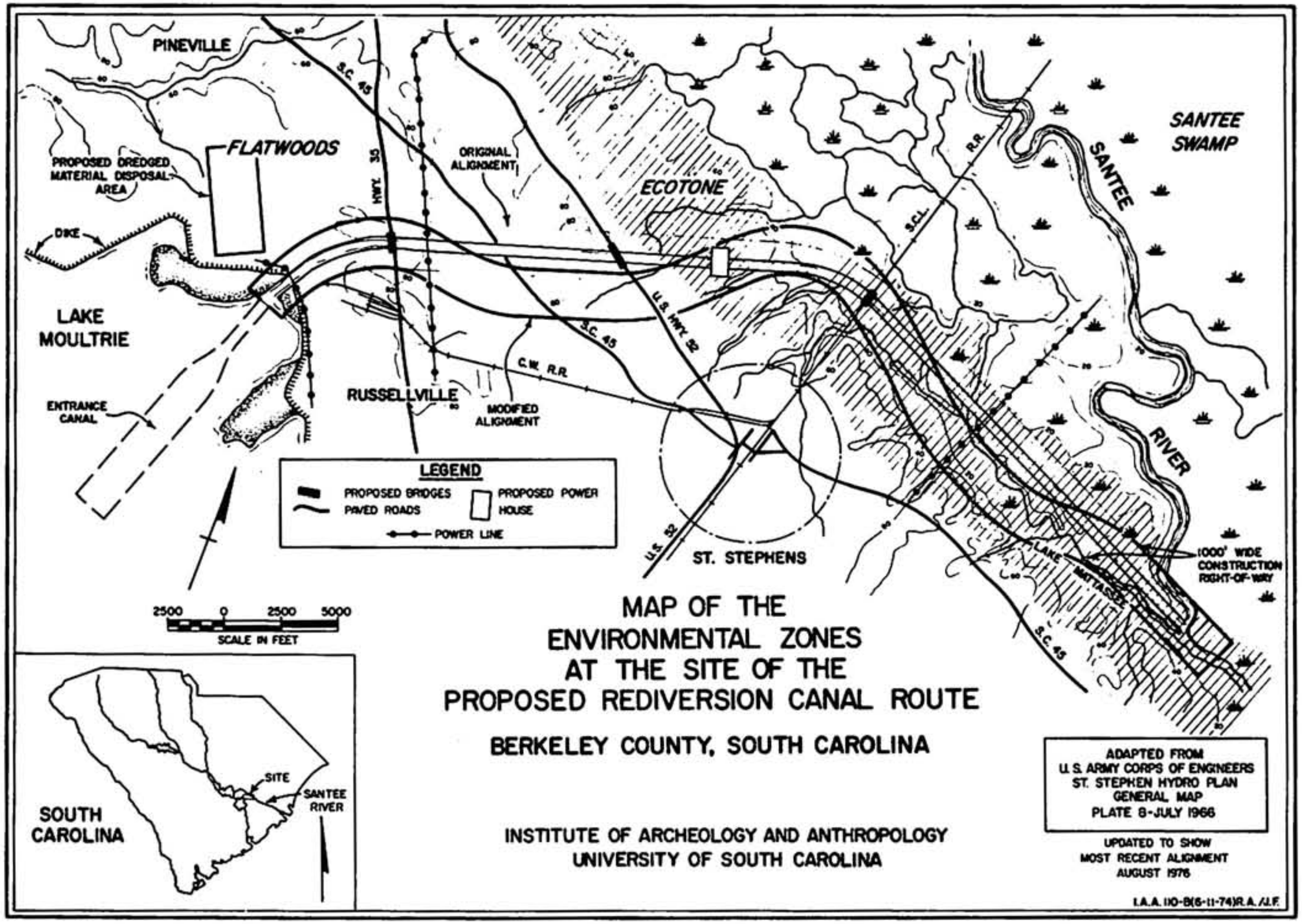


Figure 1. Cooper River Rediversion Project Area showing environmental zones (after Brockington 1980).

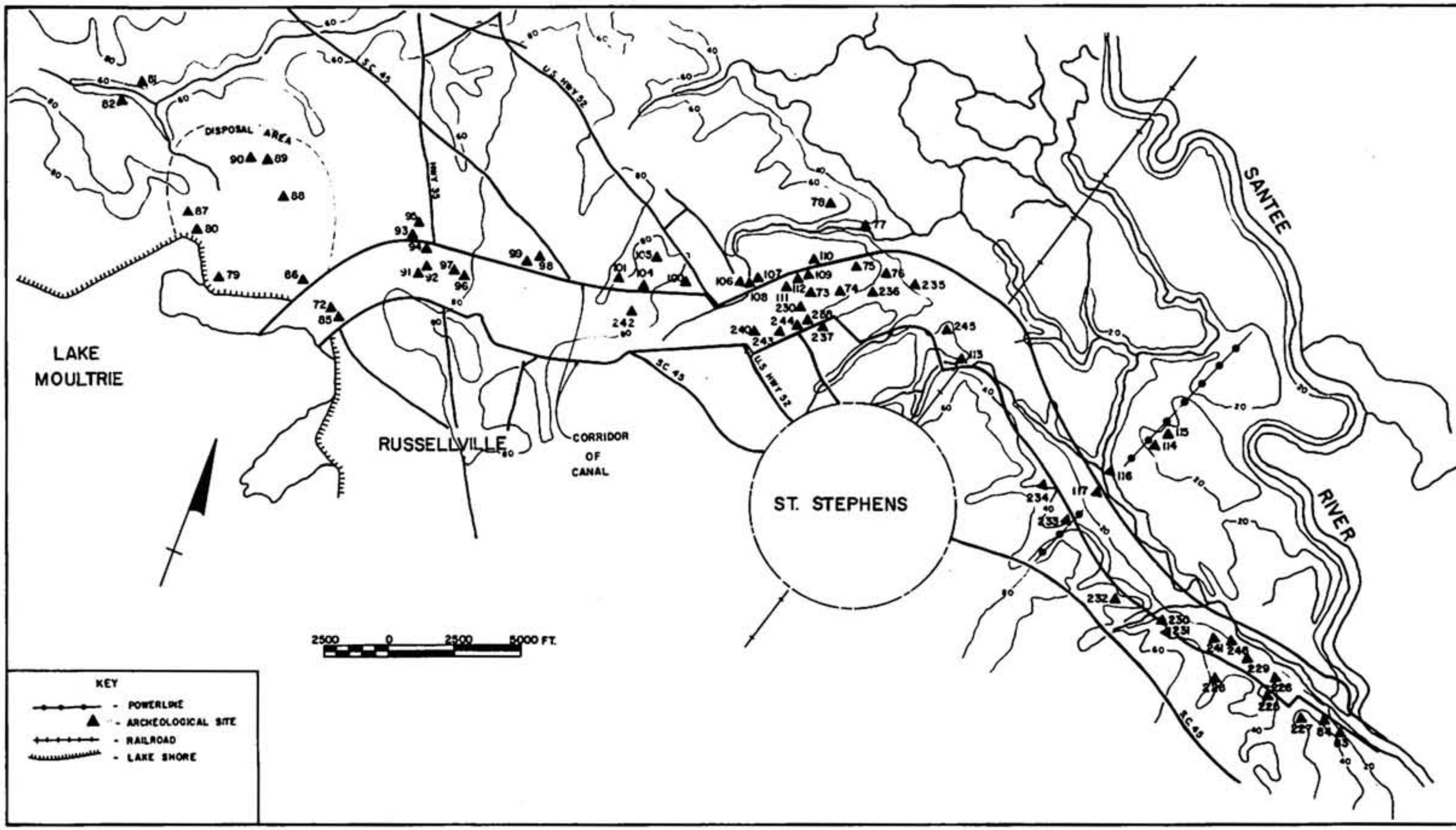


Figure 2. Cooper River Rediversion Project area showing location of archeological sites (after Brockington 1980).

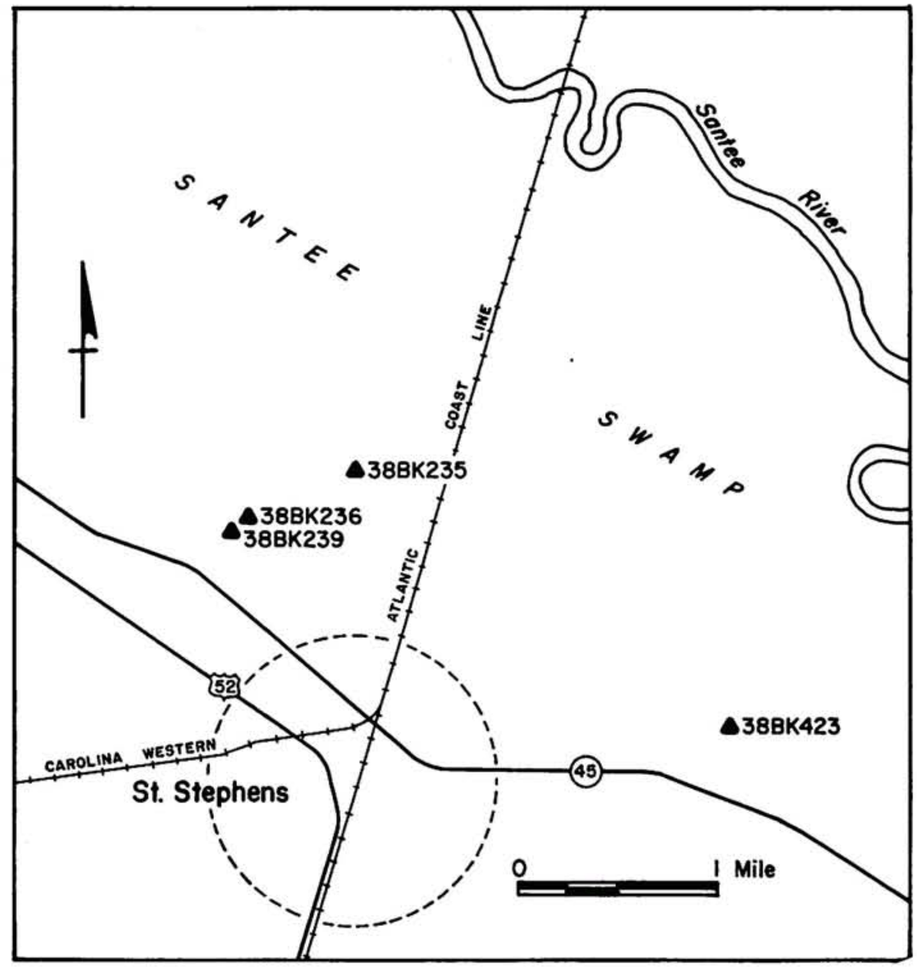


Figure 3. Location of area of study.

Brockington (1980: 97-102) recommended that the sites be studied according to a two-phase plan. Through the dispersal of a number of small test squares based on a sampling design for each site, Phase I, intensive testing, would result in a representative sample of artifact and feature patterning. Data obtained from this phase, in turn, would be used to plan Phase II, the excavation of large block units in activity areas containing features and/or artifact concentrations.

In large part, Brockington's recommendations were followed. Under his direction, Mark J. Brooks supervised a field crew of between six and eight members in a testing and intensive excavation program in 1979 (ca. 47 person-months). Testing at sites 38BK235, 38BK236, and 38BK239 occurred in March and April, and intensive excavations continued at sites 38BK235 and 38BK236 from May through the first week in September. Site 38BK423, which was threatened during construction, was tested the last week in October.

Sites 38BK239 and 38BK423 were characterized by relatively low artifact densities. No features were apparent at either site. Site summaries for them may be found in Appendix A. By contrast, sites 38BK235 and 38BK236 contained evidence of structures, a number of subsurface features, such as pits and hearths, and surprisingly heavy concentrations of ceramic, lithic, botanical, and osteological (animal and human) remains. The preservation of macrobotanical and bone remains was quite remarkable considering the poor preservation potential of the soils. Furthermore, the Mississippian house structure and the burned human bone occurring at site 38BK235 are the first features of their kind to have been excavated and analyzed in the interior Lower Coastal Plain of South Carolina.

The documentation of these data is extremely important. Even more important is their study in the context of ecological and sociocultural processes that affected their appearance and location. During the survey, Brockington (1980: 15) recognized that prehistoric occupation of the interior Lower Coastal Plain was more substantial than formerly modeled, and he predicted that relatively large, more nearly permanent late prehistoric settlements would occur in the ecotone zone. Because the interior Lower Coastal Plain is an area about which little was, and still is, known archeologically, the subsistence-settlement information gathered from the survey, testing, and excavation stages is critical to any understanding of prehistoric adaptation in the area.

Paul E. Brockington, who was the principal investigator, left the project in June of 1979, and William H. Marquardt assumed responsibility for the contract and sub-contract negotiations that fall and winter. Mark J. Brooks continued in his supervisory position, and in February 1980, Veletta Canouts became principal investigator. In that interim, they developed a more refined model of later prehistoric subsistence change using survey settlement distributions, interdisciplinary data on the effects of late Holocene sea level change on the coastal environments, and recent subsistence economic literature (Brooks and Canouts 1980). Although earlier components were represented in the area and at the sites investigated by the Institute, the late prehistoric periods, Middle-Late Woodland and Mississippian, were emphasized because of the significant amount of new information recovered.

Briefly, the research design for the analysis addresses the economic subsistence strategies of inhabitants in the interior Lower Coastal Plain from 1,000 to 2,500 B.P. Recent environmental-ecological reconstructions of Berkeley County (Widmer 1976; Brooks 1980) and ethnohistorical accounts (Waddell 1980; Harriss 1952; Jones 1978) suggest that the interior could have been exploited more intensively than accounted for by previous coastal-interior transhumance models (Larson 1970, 1980; Milanich 1972, 1973; Milanich and Fairbanks 1980). Archeological sites located during the project survey and other surveys in the area (Brockington 1980; Brooks and Scurry 1978; Brooks 1980), especially the number of sites recorded in the interriverine areas of the interior Lower Coastal Plain, provide evidence not only for possible year-round habitation, but for a major shift in the site settlement pattern from the Middle-Late Woodland period. The Middle-Late Woodland settlement appears to reflect the generalized exploitation of riverine and interriverine resources, whereas the Mississippian strategy apparently focuses on the intensive exploitation of a relatively narrow range of specific, high-density, riverine--particularly river swamp--resources.

Model-building to guide research is a scientific approach for appropriately bounding units of reality. As abstractions, these models have no inherent truth, but insofar as they generate testable hypotheses, they can be evaluated on their ability to account for the observable phenomena. As data become available, the process of model-building is refined and more lawlike generalizations are conditionally qualified, integrated, and confirmed. No one model can "best fit" the entire archeological resource base investigated in the course of this project, though a series of models may be hierarchically arranged according to their level of generalization.

The model presented herein is dichotomous or contrastive; distinctions are made between coastal and interior, riverine and interriverine, and Middle-Late Woodland and Mississippian. Obviously, geographical and temporal boundaries are not so discontinuous, and neither are the underlying sociocultural adaptive processes. However, binary oppositions often appear initially in formal attempts to elicit broad differences in little known research areas. Furthermore, the general hypothesis is not site-specific or data-specific. Thus, a series of site-specific, corollary hypotheses was derived from the general hypothesis. Data from these two sites cannot test or support generalizations beyond the site level. In this case, both sites are multicomponential and are located in the same environmental, riverine zone. Additional site data, especially from single-component sites and interriverine sites, will be necessary to refine the model further. Moreover, the methodological approaches used to test the hypotheses have their own strengths and weaknesses. Testing conditions will be improved, in the future, through greater methodological rigor.

The paleoecological data sets are most directly related to the reconstruction of ecological communities and the identification of potential subsistence items. The most obvious limitations of such data are their lack of preservation and the problems of distinguishing between the naturally and culturally related occurrences of these data in the site assemblages. The materials were analyzed by outside specialists. At the American Archaeology Division of the University of Missouri, Columbia, Deborah M. Pearsall and Eric E. Voigt identified the macrofloral remains, and Dr. Pearsall also identified plant phytoliths, (Data Supplement I). Their colleague at the Division, Sarah W. Neusius, performed the osteological analysis (Data Supplement II). An earlier study of the geology of the St. Stephens area had been submitted by Donald J. Colquhoun, Department of Geology, University of South Carolina, during the survey and testing phases (Data Supplement III). Michael J. Andrejko, also from the Department of Geology, University of South Carolina, analyzed the pollen for the Organic Sediments Research Center (Data Supplement IV). The pedological analysis was conducted by Alf Sjoberg at the Laboratory for Archaeological Soils Chemistry, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill (Data Supplement V).

The strong functional, technological, and environmental relationship of archeological features and assemblages has been recognized in archeological circles since the 1950s, but only in the past decade have functional analyses based on refined experimental and ethnoarcheological studies been assiduously pursued. The attempt here to apply recent methods of functionally oriented analyses (from experimental or small samples) to the study of entire artifact assemblages (from archeological sites) is one of the first such studies in this state. Helen W. Haskell and JoLee A. Pearson, staff members at the Institute of Archeology and Anthropology, conducted the ceramic analysis; Pearson undertook the petrographic and X-ray diffraction analyses (Data Supplement VI). Keith M. Derting, also with the Institute, analyzed the lithic assemblages (Data Supplement VII).

This scale of analysis would not have been possible without computer assistance. The computer work was coordinated by Jim Sexton with the help of the Social and Behavioral Sciences Lab at the University of South Carolina. The amount of data generated by this project precludes presentation of individual artifact and ecofact data in the main body of the report. These data are referenced in the data supplements. Those data specifically relevant to the hypotheses being tested are the focus of this synthetic study.

The results of this study have general relevance to methodological and substantive concerns of archeologists working in the southeastern United States. The partial support of the hypotheses, as they now stand, has already refined the traditional models of late prehistoric occupation and exploitation in the interior Lower Coastal Plain. Based on early ethnohistorical observations of coastal groups, the absence of good environmental data, and minimal archeological survey investigations, archeologists adopted a model of coastal-to-interior transhumance in the fall and winter. This study provides incontrovertible evidence that the interior riverine zone was also occupied and exploited in the summer and early fall by Middle-Late Woodland and Mississippian populations. The role that coastal resources may have played in late prehistoric subsistence strategies, for both periods, cannot yet be assessed; nor are the environmental and sociocultural reasons behind the subsistence-settlement change in the interior clearly understood. The formulation of this model is a beginning attempt to describe and analyze the differences, observed initially in site locations, within a framework of economic and human ecology.

CHAPTER 2

MIDDLE-LATE WOODLAND AND MISSISSIPPIAN SUBSISTENCE STRATEGIES IN THE LOWER COASTAL PLAIN OF SOUTH CAROLINA

Introduction

Traditional models of late prehistoric adaptation on the South Carolina Atlantic Coastal Plain hypothesize seasonal transhumance between coastal and interior environments (Larson 1970; Milanich 1972, 1973). Larson (1970) suggests that after 1,000 B.P. the interior Coastal Plain of the Southeast was an ecological zone dominated by pine barrens. Accordingly, the low biomass of the long-leaf pine-dominated forest, which is created and maintained by natural and lightning-caused fires, could not provide adequate subsistence resources for human populations. With the possible exception of some sporadic, short-term habitation along the major rivers, the interior Lower Coastal Plain was, therefore, largely uninhabited (Larson 1970).

Milanich (1972, 1973) has a similar view for the earlier 1,000-3,000 B.P. year period. In contrast, however, Milanich puts slightly more emphasis on the subsistence potential of riverine floodplains for seasonal, fall and winter, habitation by coastal peoples. Finally, because of the hypothesized lack of subsistence resources, both Milanich and Larson predict that no prehistoric sites will be found in the upland flatwoods or interriverine zone.

In slightly modified form, these models continue to be applied (Larson 1980; Milanich and Fairbanks 1980; cf. Goodyear 1982; Brooks 1982). However, their generality, resulting from a lack of archeological data and simple environmental reconstructions, obscures the variability present within the interior Lower Coastal Plain. Archeological, ethnohistorical, and environmental-ecological data, obtained largely from Berkeley County and the Cooper River Rediversion Project, suggest that this variability may reflect year-round exploitation and/or habitation in the interior Coastal Plain. These data do not, however, exclude a broader pattern of transhumance. Therefore, both patterns may be applicable, as the distances involved in a coastal-interior seasonal round would not be very great. The distinction between coastal and interior areas is arbitrary and definitional.

What is important to consider is the subsistence resource potential of the nonestuarine-associated, interior riverine and interriverine zones of the Lower Coastal Plain. The distinction between riverine and interriverine is also a somewhat arbitrary boundary. In this, the discussion diverges from Brockington's (1980) original consideration of an ecotone, which is a difficult concept to define and model dynamically at this initial research stage (cf. Odum 1971: 157-159; Rhoades 1978; Davy 1980; King and Russell 1981). In accordance with the basic research being conducted at the Institute, the riverine zones are defined as the major rivers draining the interior of the state, including their associated floodplains, swamps, and terraces; the interriverine zones are the areas between the major drainages that contain higher ranking streams (cf. House and Ballenger 1976; House and Wogaman 1978; Goodyear, House, and Ackerly 1979: 131-132; Brooks 1980).

The Case for Year-Round Habitation

Because of the seeming pine barrens that today dominate the interior Coastal Plain and were described as early as the mid-eighteenth century, previous archeological reconstructions of the natural resource base emphasized the lack of subsistence resources in the pine forests. In marked contrast with this overly general picture, it has been suggested recently that the environment of the interior Coastal Plain is one with abundant subsistence resources and suitable raw materials, such as stone and clay, for prehistoric use (Widmer 1976; Brooks and Scurry 1978; Brooks et al. 1979; Brooks 1980; Brockington 1980). However, these resources are not uniformly distributed. Rather, they are differentially distributed within and between the broadly different riverine (rivers and associated floodplain-swamp and terrace microenvironments) and interriverine (upland flatwoods or pine barrens) environmental zones. From the perspective of potential subsistence resources, differences in the biotic communities occurring in these environments are directly related to variability in soil and moisture characteristics.

Estimation of the aboriginal extent of these environments, particularly the pine barrens, is necessary for evaluating their subsistence resource potential and productivity. Quarterman and Keever (1962) present quantified data indicating that, in the Coastal Plain, the southern loblolly-shortleaf pine is in a subclimax stage, succeeded by a mixed hardwood forest.

Although the loblolly-shortleaf pine forest is currently dominant in most of the Coastal Plain, it is probable that this is due to a long history of natural and man-induced burning, logging, and planned forest management, which has resulted in a nearly total replacement of a southern mixed hardwood forest climax (Quarterman and Keever 1962). Chapman (1905) notes that the loblolly-shortleaf pine composition tends to be associated with flat, moist lands, swamp edges, and well-drained bottomlands. Much of the Coastal Plain is characterized by these physiographic features (Dames and Moore 1976). Given the ability of loblolly-shortleaf pine to adapt to a broad range of edaphic conditions, and its encouragement by historic and modern land management practices, it is not surprising that loblolly-shortleaf pine also frequently occurs on the higher, better-drained soils. Nevertheless, as Quarterman and Keever (1962) demonstrate, the more shade-tolerant species of the Southern mixed hardwood climax forest would tend to replace pine in these mesic areas, given time and no additional interference by man.

Longleaf pine, on the other hand, prefers higher, lighter, better drained soils and is, therefore, more restricted in distribution than loblolly. As with the mesic-adapted, mixed hardwoods, longleaf pines are most strongly associated with the well- to moderately well-drained soils occurring at higher elevations.

Hardwood stands, found on tracts that are better drained than those containing hardwood swamp associations, appear to represent the original southern mixed hardwood climax forest (Quarterman and Keever 1962). Various species of oak and hickory are significantly represented in these mesic-adapted, mixed hardwood associations. Mesic-adapted vegetation such as oak and hickory prefer the higher, well- to moderately well-drained soils situated on broad, flat to gently sloping terrain. Soils in areas such as these lose relatively little precipitation to runoff, but by the same token, their permeability does not allow the soil to become saturated (Oosting 1942; Quarterman and Keever 1962; Camp et al. 1975).

The hardwood swamp associations, comprised principally of cypress and gum, are found in the hydric regions of the Coastal Plain. In upland, interriverine areas, these species occur in creek bottoms and low, poorly drained depressions. These hardwood species are also associated strongly with riverine floodplain-swamps (Dames and Moore 1975, 1976).

The Santee River and environs in the vicinity of the Cooper River Rediversion Project may have exhibited originally the magnolia-deer-oak faciation, mixed with aquatic communities and pinelands subclimaxes, of the Magnolia-Maritime Forest (Shelford 1963: 63). Such an environment was described inland along the Savannah River by Bartram (Harper 1958: 19-20) in the late eighteenth century:

> First, from the sea-coast, fifty miles back, is a level plain, generally of a loose sandy soil, producing...Pinus taeda, P. lutea, P. squarosa, P. echinata, 1. Quercus sempervirens, 2. Quercus aquatica, 3. Q. phillos, 4. Q. tinctoria, 5. Q. dentata, 6. Q. prinos, 7. Q. alba, 8. Q. sinuata, 9. Q. rubra, Liriodendron, tulipifera, Liquid amber styraciflua, Morus rubra, Cercis tilia, Populus heterophylla, Platanus occidentalis, Laurus sasafras, Laurus Borbonia, Hopea tinctoria, Fraxinus excelsior, Nyssa, Ulmus, Juglans exaltata, Halesa, Stewartia. Nearly one third of this vast plain is what the inhabitants call swamps,... their native trees and shrubs are, besides most of those already enumerated above, as follows: Acer rubrum, Nyssa aquatica, Chionanthus, Celtis, Fagus sylvatica, Sambricus; and on the higher knolls...Azalea nuda and Azalea viscosa, Corypha palma, Corypha pumila, and Magnolia grandiflora...

Within this environment dominant mammals include deer, black bear, wolves, mountain lions, and gray squirrels; the dominant bird is the turkey (Shelford 1963: 68-69).

A more recent environmental reconstruction adjacent to the Cooper River Project area defines a four-part forested mosaic: longleaf pine forest, southern mixed hardwoods, gum-cypress swamp forest, and pine savannahs (Widmer 1976: 9). Great resource diversity is reflected in a mosaic. Oak and hickory hammocks in the mixed hardwood forest would have produced quantities of edible acorns and hickory nuts, and the edges of a mosaic would have provided highly favorable deer habitats. B.D. Smith

(1975) notes that the interfaces between different biotic zones are favorable habitats for certain species of upland or interriverine game, especially white-tailed deer, whose highest population densities occur where many small areas of varying vegetation are located. In fact, in combination with mast-producing trees, the interior riverine swamp edges may have contained the highest deer densities in the state (Michie 1980: 47).

A wildlife habitat study of the nearby Francis Marion National Forest indicates a diversified habitat conducive to deer maintenance, with plentiful browse provided by titi, bay, blueberry, wild grape, yellow jasmine, red maple, honeysuckle, dogwood, and smilax (USDA Forest Service 1971). Hickory, oak, beech, and dogwood provide mast for deer. In addition to providing a seasonally varied deer diet, this setting is also favorable for turkey, woodcock, wood duck, dove, rabbit, squirrel, bobcat, raccoon, opossum, fox, and black bear (Dames and Moore 1975).

Plant resources for human exploitation would also have been abundantly available in interriverine areas. Acorns, hickory nuts, palmetto berries, flesh of the sabal palm, and various fruits such as wild cherry, plums, and persimmons, are potentially exploitable species known to have been utilized by southeastern aboriginal populations (Larson 1970).

The ethnohistorical and archeological evidence that has been used to support the lack of occupation in the pine barrens, including the river floodplains, during the Mississippian period should be re-examined. More archeological sites have been recorded and current settlement pattern analyses (B.D. Smith 1978) indicate the dispersal of farmsteads or hamlets outside of ceremonial centers. Even the ethnohistorical accounts are subject to wider interpretations (e.g., Jones 1978).

Unfortunately, the majority of the ethnohistorical translations pertain to the coastal groups. For example, at the mouth of the Edisto River, between the Santee and Savannah, Rogel relates that when the fall acorns ripened, a town of twenty houses broke up and a dozen villages relocated between sixteen and eighty miles (ca. 25-125 km) inland for nine months of the year (Waddell 1980: 47). Every two months, these people came together at various places to hold festivals. If these dwellings housed around twenty people, which is consistent with the population estimates, these villages probably consisted of extended families (Waddell 1980: 47).

A summary statement by Waddell (1980: 47) places the summer towns of the coastal groups 15 to 30 km inland along the rivers, at a point equidistant from the sandy coast and pine barrens. However, the estuarine extensions along the various river systems are more highly variable than this statement suggests. Furthermore, if the pine barrens are, in part, a more recent phenomenon, then there would be no limitation to the extent of inland habitation along the rivers of the Coastal Plain.

Sanford describes a mid-seventeenth century summer town:

> The Town is scituate on the side or rather in the skirts of a faire forrest in wch. at severall distances are diverse fields of Maiz with many little houses

straglingly amongst them for the habitation of the particular families (Waddell 1980: 48);

and according to Ferguson in 1682:

> Nor dwell they in Towns, but in straggling Plantations; often removing for the better conveniencey of Hunting (Waddell 1980: 49).

With specific reference to the Santee River, Lawson (Harriss 1952: ix) describes the settlement some 45 km inland:

> We went ten miles out of our Way to head a great Swamp.... We met in our Way with an Indian Hut, where we were entertained with fat boiled Goose, Venison, Raccoon and ground Nuts...about Noon passed...large Savannah's,...they were plentifully stored with Cranes, Geese, &c., and the adjacent Woods with great Flocks of Turkies. This day we traveled about thirty Miles, and lay all Night at a House [Indian Trader].... Such Houses are common in these Parts, and especially where there is Indian Towns and Plantations near at hand, which this Place is well furnished withal (Harriss 1952: 11-12).

Later they

> came up with a Settlement of Santee Indians, there being Plantations lying scattering here and there, for a great many miles...
>
> At the Cabins came to visit us the King of the Santee Nation (Harriss 1952: 13).
>
> Near to these Cabins are several Tombs...
>
> The manner of interment is thus: A Mole or Pyramid of Earth is raised... (Harriss 1952: 16-17).

Approximately 100 km inland on the Santee River floodplain, on what is now the northern shore of Lake Marion, is a large, seven meter high, platform mound that Lawson may have described (Leland Ferguson, personal communication; Baker 1974; Appendix B). Ceramics recovered from the mound are similar to the Pee Dee and Irene complexes (Ferguson 1973: 33), pre-dating European contact. Thus, it would appear that the habitation of the interior cannot be attributed solely to English expansion along the coast. Not only were there several Indian "plantations", or homesteads, used for farming or even hunting located along the river but political and religious activities were centered there as well.

A major archeological assumption in this research is that prehistoric sites were located in close proximity to the resources being exploited for subsistence (Jochim 1976). Therefore, changes in the distribution and productivity of various resources caused by environmental trends (e.g., sea level variability) would alter the spatial distribution of sites through time. It is for this reason that the following discussion will emphasize archeological measures of environmental variables that can be related to prehistoric subsistence-settlement.

Environmental-ecological and ethnohistorical data suggest, contrary to the Larson-Milanich model, that the interior Lower Coastal Plain of South Carolina could, and probably did, support year-round exploitation and habitation during the Middle-Late Woodland and Mississippian periods. Archeological support for this argument was obtained using data from the Statewide Site Inventory Records for Berkeley County, maintained by the Institute, and from the Huger site investigated in 1977 (Green and Brooks, in press).

For the Berkeley County data, only sites for which certain kinds of information were available, or could be reasonably calculated, were considered. Site variables of interest were: (1) site size, (2) temporal period(s) represented, (3) archeological material present, (4) density of archeological material, (5) diversity of archeological material, (6) drainage rank association (Rank 5 was considered riverine [Strahler 1964]), (7) distance from nearest drainage, (8) elevation above nearest drainage, and (9) soil drainage quality. A consideration of site files containing data pertinent to these variables resulted in the fortuitous sample size of 100 sites (temporal components). Taken together, the Middle-Late Woodland and Mississippian periods constitute 75% of the sample.

Sixty-six percent of the sites, i.e., temporal components, in the Berkeley County sample are attributable to the Middle-Late Woodland period (ca. 1,000-3,000 B.P.). Temporally diagnostic artifacts include decorated ceramics of the Deptford (particularly check stamping) and Cape Fear-Wilmington (fabric impressed and cord marked) ware groups (South 1973, 1976). Of these sites, 15% occur in a riverine setting whereas 85% occur in an upland, interriverine context. As expected from a consideration of the environmental-ecological and ethnohistorical data, the interriverine sites are typically small, dispersed (multidimensional measures of dispersion indicated by a consideration of variables 6-9 above), located on the relatively well-drained soils, and are characterized by low artifact density and diversity. Archeological material is largely restricted to a few ceramic artifacts, broken and exhausted bifacial lithic tools, and small, bifacial thinning and resharpening flakes. Tool use and maintenance, but not manufacture, is indicated. These data, taken together, strongly support the view that these sites represent primarily the dispersal of human populations into short-term, seasonal (fall and early winter), deer hunting and nut procurement camps (see Brooks and Scurry 1978; Brooks 1980).

Middle-Late Woodland riverine-associated sites are located primarily on bluffs and terraces overlooking river swamp margins. Although considerably fewer than their interriverine counterparts, they tend to be much larger and contain a relatively high density and diversity of archeological materials, suggesting a broad range of activities involving the manufacture, use, and maintenance of various tools. Considerable population concentrations, at least on a seasonal (winter-summer) basis, are also suggested.

In contrast, only 10% of the sites (temporal components) in the Berkeley County sample are Mississippian (ca. 400-1,000 B.P.). Temporally diagnostic artifacts include complicated stamped ceramics of the Chicora and York ware groups (South 1973, 1976). This is a substantial reduction in the number of sites from the Middle-Late Woodland period. Although this is significant in itself, the major importance lies in the direction of change indicated.

During the Mississippian period, there is drastic reduction in the number of riverine and, especially, interriverine sites. Half of these sites (only 5 sites) occur in upland, interriverine areas and are extremely ephemeral, primarily isolated lithic or ceramic finds. Riverine Mississippian sites (also 5), while fewer in comparison with Middle-Late Woodland riverine sites, tend to be larger with higher artifact density and diversity.

The above observations are supported by data obtained later during the reconnaissance and intensive testing phases of the Cooper River Rediversion Project (Brockington 1980) and the Amoco Realty Project (Brooks and Scurry 1978). All these data suggest a major decline in the use of the interriverine zone from Middle-Late Woodland to Mississippian times. Conversely, utilization of the riverine zone appears to have intensified, resulting in permanent or nearly permanent villages during the Mississippian period.

From the archeological data, in conjunction with the environmental-ecological and ethnohistorical data presented earlier, it must be concluded that the Larson-Milanich model is inappropriate for the Berkeley County area and, by extension, other areas of the South Carolina interior Lower Coastal Plain. Although upland, interriverine sites are relatively small, they are numerous and indicate utilization during Woodland and Mississippian times. Similarly, the large intensively occupied Woodland and Mississippian sites along the major river valleys hardly represent the small, intermittent camps predicted by Larson and Milanich. In considering all lines of available data, it is tentatively concluded that the interior Lower Coastal Plain was occupied, or at least seasonally exploited, year-round during the 400-3,500 B.P. interval in question. However, the archeological data presented also indicate a major shift in site-settlement patterning and, by inference, subsistence from Middle-Late Woodland to Mississippian times. It is to this subject that we now turn.

Modeling Middle-Late Woodland and Mississippian Subsistence Change

As discussed above, the resource potential of the riverine and interriverine zones seems adequate for year-round habitation in the South Carolina interior Lower Coastal Plain. However, differences between Middle-Late Woodland and Mississippian settlement, and by inference, subsistence, are distinct. These differences may reflect a basic change in adaptive strategies. Model-building at this stage is an effective way to identify and define variables relevant to an analysis of subsistence-settlement differences.

Two basic assumptions provide the rationale for the model. First, throughout most of prehistory, human populations were predominantly hunter-gatherers who adapted to the seasonal availability of specific high density resources in various environmental and microenvironmental zones. That is, the natural spatial and temporal structure of resources directly conditioned human settlement (Schneider 1974; Jochim 1976; Binford 1977). This assumption is not meant to discount the importance of other economic variables, or social and demographic variables, which must ultimately be considered if we are to understand the total adaptive system and its range of synchronic and diachronic variability. Second, given that subsistence was of primary importance prehistorically, site-settlement patterning should most directly reflect adaptations to the subsistence resource base. Consequently, in large part, observed changes in settlement patterning over time are assumed to reflect a continuous process of adaptation to this resource base. Environmental conditions and changes affected resource variability and these changes, in turn, strongly conditioned the behavioral strategies and directions of the adaptive processes.

Subsistence Economics

Subsistence entails the extraction of matter and energy from the natural environment in order to meet human adaptive requirements. Within biological, environmental, and cultural constraints, the choice of alternative subsistence strategies appears to favor risk minimization or a least-cost model of decision making (Earle 1980: 1-2). In a least-cost model, resources that can be procured most efficiently will be exploited first, with progressively more costly resources added until subsistence requirements are met. However, because the efficiency of a strategy is a function of the amount exploited per unit cost, efficiency declines as a strategy is intensified (Earle 1980: 12). This trend can be demonstrated by a consideration of the three general procurement strategies of hunting, gathering, and agriculture employed in subsistence-oriented societies.

From Earle's (1980: 13, 17-21) discussion of cost curves, hunting has the lowest initial cost because there is a higher energy yield to energy expenditure ratio when large, high density game animals are procured. Hunting is a preferred first strategy, but gathering generally accompanies hunting, albeit at slightly higher costs, because it has a higher potential yield in terms of plant biomass. If hunting and gathering strategies are intensified (to be discussed), they encounter rapidly rising costs due to the naturally limited resource yields per unit area. To reduce costs, resource selection becomes diversified and agricultural production may ensue. Agriculture is generally added last because it has the highest initial costs related to constructing and maintaining an artificial environment. However, it also has the highest potential annual yield in that the yield can be artificially increased (Earle 1980: 3). Thus, when conditions require higher production, agriculture may be increasingly relied upon because yields are directly correlated with the degree of intensification.

Riverine and interriverine zones in the interior Lower Coastal Plain provide a number of edible floral and faunal species. Some species crosscut these zones while others, due to specific tolerance limits, are primarily associated with one zone or the other. Subsistence strategies generally reflect decisions about productivity based on resource distributions and seasonal cycles. Archeological and ethnohistorical data indicate that white-tailed deer, acorns, and hickory nuts were highly preferred species, comprising extremely important components of subsistence economies (Caldwell 1958; Lewis and Lewis 1961; Morse 1967; Parmalee 1969; DeJarnette, Kurjack and Cambron 1962; Fowler 1959; B.D. Smith 1975; Swanton 1946; Larson 1970; Canouts 1971; Hudson 1972; Hilton 1959; Ashe 1959; Harriss 1952).

Several environmental and ecological factors suggest that these seasonally associated resources can be most efficiently procured in upland interriverine areas during the fall and early winter when the nuts ripen and the deer aggregate to feed on them (B.D. Smith 1975). Except when stored, acorns and hickory nuts are available only during the fall and early winter. The storability of nuts would make them a particularly attractive resource in that they could be utilized during the leaner winter months. The high densities of oak and hickory in upland mesic areas (well- to moderately well-drained soils) and the nonmobile nature of these resources would make them particularly economical to exploit.

Deer territories tend to be less than two square miles. Seasonal movement within their territories depends on the seasonal availability of different plant foods. Beginning in August, with the availability of acorn mast, acorns become the primary food of deer, and there is a high concentration of deer in upland hardwood zones (B.D. Smith 1975). Two factors of white-tailed deer behavior make fall and early winter deer hunting optimal during this season. First, within upland zones there is a high and predictable deer concentration. Second, the fall rutting season produces a behavioral change, especially in male deer, allowing them to be decoyed within killing range by rustling bushes with a stuffed deer head or other means (B.D. Smith 1975).

Nutritionally, acorns and hickory nuts are complementary; acorns are rich in carbohydrates and hickory nuts are rich in plant protein and fats (Asch, Ford, and Asch 1972). Deer, of course, would be an important source of animal proteins and fats. These fall and early winter resources in upland interriverine zone areas would not produce substantial scheduling conflicts with the procurement of winter through summer seasonally available resources in the riverine zone. Actually, they would be complementary components of a seasonally varied yearly diet. The procurement of deer and nuts during the fall and early winter would be particularly economical in that both could be efficiently exploited due to their close spatial association. Further, the high densities and biomass of these resources during the fall and early winter would make them more economical to exploit than other upland interriverine zone resources, which, regardless of the season, would be too dispersed and/or insufficient in biomass to be efficiently exploited, except on an opportunistic basis.

The structure of the interriverine resource base in South Carolina's Lower Coastal Plain corresponds to B.D. Smith's (1975) model (Brooks 1980). The structure of the riverine resource base is less well-documented in the Southeast. B.D. Smith (1978) describes the relevant energy resources for an agrarian adaptation to the Mississippi River floodplain. Highly productive wild resources, such as migratory waterfowl and fish, are also considered in his model. At this time, no comparable human ecological studies have been undertaken for the river drainages below the Fall Line on the Atlantic Coastal Plain, for example, the Santee River. Some general observations can be set forth, however.

A wide variety of potential subsistence resources occurs in interior, riverine microenvironments. Seasonally available resources are present primarily from winter through summer. They include migratory waterfowl, various species of ducks, geese, and teal; anadromous fish, i.e., striped bass, blueback herring, American shad, hickory shad, alewife, sturgeon, American eels; and various plant resources, i.e., wild rice, arrowhead, etc. (Dames and Moore 1975; Interstate Commerce Commission 1977; Federal Power Commission 1977). All of these riverine zone resources are known to have been important subsistence items to prehistoric populations in the coastal areas of the southeastern United States (Swanton 1946; Harriss 1952; Larson 1970).

Subsistence resources available year-round in the riverine zone include deer, beaver, otter, mink, alligator and various turtle, snake, mussel and snail species. Freshwater fish include bowfin and species of the sunfish, catfish, and gar families (Dames and Moore 1975; Interstate Commerce Commission 1977; Federal Power Commission 1977). The aquatic species, principally the fish and turtles, could be most readily procured from oxbow lakes and backswamps as they dried up during the late summer (B.D. Smith 1975).

Subsistence Change

From a least-cost perspective, subsistence change may be attributed to changes in the output requirements for the subsistence economy and/or changes in cost parameters (i.e., environment, technology, social organization). The cost parameters have been thoroughly discussed in the archeological and anthropological literature and need not be reviewed (e.g., Steward 1955; White 1959; Harris 1968; Earle 1980). The following discussion will focus on changes in output requirements as they relate to subsistence change.

Many researchers have attributed changes in output requirements of subsistence economies to changes in human population, usually growth (Malthus 1960; Boserup 1965; Binford 1968; Cohen 1977; Earle 1980; Christenson 1980). It is generally held that with increasing population, subsistence economies are intensified, starting with existing strategies. As these strategies are intensified, their marginal costs increase. When these costs equal the initial costs of other strategies, other, new strategies are added (Earle 1980; Christenson 1980).

Increasing population growth, with consequent effects on subsistence resource variability, is thought to be a contributing factor in settlement variability observed in the archeological record. More importantly, however, the archeological and geological data indicate that observed changes in riverine and interriverine settlement from Middle-Late Woodland to in riverine and interriverine settlement from Middle-Late Woodland to Mississippian periods in the interior Lower Coastal Plain may be attributed, in large part, to subsistence resource variability brought about by a generally rising sea level (Brooks et al. 1979; Brooks 1980; Colquhoun et al. 1980).

Studies of environmental change in the Southeast have based paleoenvironmental inferences largely on vegetational communities reconstructed through pollen data obtained from buried lake and bog deposits (Whitehead 1965, 1972, 1973; Watts 1971, 1980). These data indicate that the subsistence resource potential proposed here for the interior Lower Coastal Plain probably has existed generally since about 3,500 B.P.

Between 5,000 and 10,000 B.P., the oak-hickory forest attained its maximum development. Both riverine floodplains, for example, the Santee River, and upland areas were probably dominated by oak-hickory and associated faunal communities. However, Watts (1971, 1980) hypothesizes the occurrence of numerous open savannahs in upland, interriverine areas. Because of an edge-area effect, or mosaic, upland areas may have contained a greater density and diversity of terrestrial plant and animal resources than the floodplains.

Over the last 5,000 years, microenvironmental diversity has been maximal. The upland, interriverine zone gradually became dominated by pine forests with lower biomass. However, some oak-hickory stands remained on remnant patches of better-drained soils. The shift from oak-hickory to pine-dominated forest resulted in part, from changes in soil drainage induced by sea level changes. Although the higher elevations have remained relatively stable, the Holocene sea level rise has directly inundated some areas and raised the water table through eustatic pressure in others. This would reduce the amounts of better-drained soils at lower elevations in such a manner that mesic-adapted species (e.g., oak and hickory and, correspondingly, deer) would be replaced by hydric-adapted species (Whitehead 1965; Brooks and Scurry 1978; Brooks et al. 1979; Brooks 1980; Colquhoun et al. 1980).

The lower river gradient caused large swamps to form along the major, nonestuarine, interior rivers, especially after 3,500 B.P. (Whitehead 1965). These swamps, including the existing Santee River swamp, are dominated by hydric-adapted hardwood species, such as cypress, gum, tupelo, maple, and some nut-bearing trees. The development and expansion, both inland and laterally, of river swamps over the last 3,500 years is thought to have brought a tremendous increase in the density and diversity of subsistence resources (especially aquatic resources) occurring in riverine environments (Whitehead 1965; Brooks and Scurry 1978; Brooks et al. 1979; Brooks 1980; Colquhoun et al. 1980; Brooks and Canouts 1981).

Sea-level rise during the Holocene has not been uniform. Instead, transgressive-regressive cycles involving one- to two-meter fluctuations have occurred at 400-600 year intervals (Brooks et al. 1979; Brooks 1980; Colquhoun et al. 1980; Fig. 4). The temporal interval for which these archeological and geological data are sufficient to infer sea-level/subsistence-settlement correlations extends from 1,000 to 4,200 B.P., corresponding to the Late Archaic and Woodland periods. Short-term sea level changes cannot presently be related directly to Mississippian subsistence-settlement patterns. For now, the implications of short-term sea-level fluctuations for interriverine subsistence-settlement during the Woodland period can be examined using the survey data from the Amoco Realty project area, located 21 km inland from Charleston, South Carolina (Brooks and Scurry 1978; Brooks 1980). No attempt has been made to correlate known sea-level fluctuations with Woodland riverine subsistence-settlement patterns. Future refinement of regional scale models of prehistoric subsistence-settlement is contingent upon the ability to refine the existing sea level curve and to correlate known sea level flunctuations with consequent subsistence resource variability in the various environmental zones.

Data have been presented suggesting that interior, interriverine sites probably represent primarily the exploitation of acorns, hickory nuts, and deer. Interriverine sites of all prehistoric periods tend to occur on well- to moderately well-drained soils (Brooks and Scurry 1978; Brooks et al. 1979; Brooks 1980), which produce the highest densities of oak and hickory trees (Quarterman and Keever 1962). However, site-soil association appears to have been variable over time because of the reduction in the amounts of well- to moderately well-drained soils during high sea-level stands.

Under conditions of fluctuating sea level, as suggested by Fairbridge (1961), higher sea-level stands would result in a reduction of land mass. This reduction, in combination with an assumed trend in human population growth throughout the Woodland period and into the Mississippian period, would bring about a reduction in the size of band territories and a "packing effect" on human populations (e.g., Binford 1968; Birdsell 1968; Cohen 1977). Furthermore, during high sea levels, there would be a reduction in nut and deer productivity. This would also tend to promote a labor-intensive economy. Given the labor-intensive exploitation of nuts and deer, there should be an increase in the number of archeologically recognizable sites due to a greater artifact accumulation per unit area. Conversely, during lower sea-level stands, much of the pressure would be off, and nuts and deer would be exploited on a more areally extensive basis. This should result in fewer archeologically recognizable sites.

There is a direct correlation between the number of sites observed during a given time period and relative sea level position. The position of the sea level is indicated by the fresh to brackish transition in marsh clays and intertidal peats of the Cooper River-Grove Creek marsh and other coastal estuarine areas (Fig. 4, see Brooks et al. [1979] and Colquhoun et al. [1980] for a discussion of the geological data and techniques employed). At higher stands of sea level (1) more sites are observed, (2) more sites occur on less well-drained soil patches, (3) sites are located at higher elevations, and (4) sites are located at greater distances from the nearest drainage (Brooks et al. 1979; Brooks 1980; Colquhoun et al. 1980). Thus, in contrast to estuarine shell middens and marsh sediments, interriverine sites provide an indirect measurement of sea-level change.

Specifically, the Amoco Realty data suggest interriverine sites cluster at 1,000-1,600 B.P.; 1,750-2,250 B.P.; 2,850-3,300 B.P.; and 3,700-4,200 B.P. (Brooks et al. 1979; Brooks 1980; Colquhoun et al. 1980). The variability evident between 3,700-4,200 B.P. is probably due to the dating of interriverine sites that rests largely on cross-dating and seriation of artifact assemblages rather than on direct radiometric measurements. The geological data do not yet support the youngest temporal clustering of sites observed (1,000-1,600 B.P.). That observation is supported, however, in northwest Europe (Rhode 1978), suggesting coincident sea level trends, probably due to glacio-eustatism (Colquhoun et al. 1980).

The Mississippian period site-settlement data presented indicate a major decline in the use of the interriverine zone and/or that the exploitive patterns utilized changed in a manner that did not leave recognizable traces in the archeological record. It has been suggested that during the Mississippian period a continuing general rise in sea level brought about a continuing reduction in the amounts, and increased dispersion of, the better-drained soils. Correspondingly, interriverine resources, such as nuts and deer, became more dispersed and less economical to exploit. A continuing general rise in sea level, on the other hand, is thought to have increased riverine productivity, particularly in river swamps, and to have been at least partially responsible for the observed Mississippian settlement, representing a shift in emphasis toward riverine areas.

A similar view is expressed by Brockington (1980: 89) in his statement that "perhaps there were environmental changes in the upland zone at the end of the Woodland period, making it less productive. Most likely, Mississippian subsistence was focused on such labor intensive and/or high return activities that exploitation of upland resources was precluded as not being worth the extra effort. In addition, there may have been scheduling difficulties between exploitation of upland and riverine resources that forced elimination of upland exploitation."

Ferguson (1973) notes that Mississippian populations were concentrated along river systems with broad floodplains, presumably emphasizing bottomland-terrace agriculture. In this regard it is interesting that Mississippian sites tend to be associated more strongly with the Santee than the Cooper River (Anderson 1975). This may be due to the fact that the former is characterized by broad floodplain bottomland areas with extensive river swamps, whereas the latter is not.

Although Ferguson may be substantially correct, the abundance of seasonal and year-round, natural, subsistence resources available in floodplain-associated river swamps cannot be ignored. This may be especially true if a generally rising sea level brought about an expansion of interior Lower Coastal Plain river swamps during Mississippian times. Such expansion would bring about a corresponding general increase in productivity of river swamp-associated subsistence resources. It also may be that certain subsistence resources became available or abundant for the first time. The sluggish nature of river swamps would probably have provided greater amounts of fish, turtles, etc., than the fast-moving river channels or small upland swamps and creeks. In addition, fish traps, impoundments, or other mass-collecting and -killing operations would be more effective in backwater areas than in fast-moving river channels.

While it is suspected that this general reconstruction of Mississippian subsistence-settlement is correct, the 1,000-1,600 B.P. site cluster (Fig. 4) indicates a high sea level stand just prior to the Mississippian period (ca. 400-1,000 B.P.). If this is correct, and assuming trans-

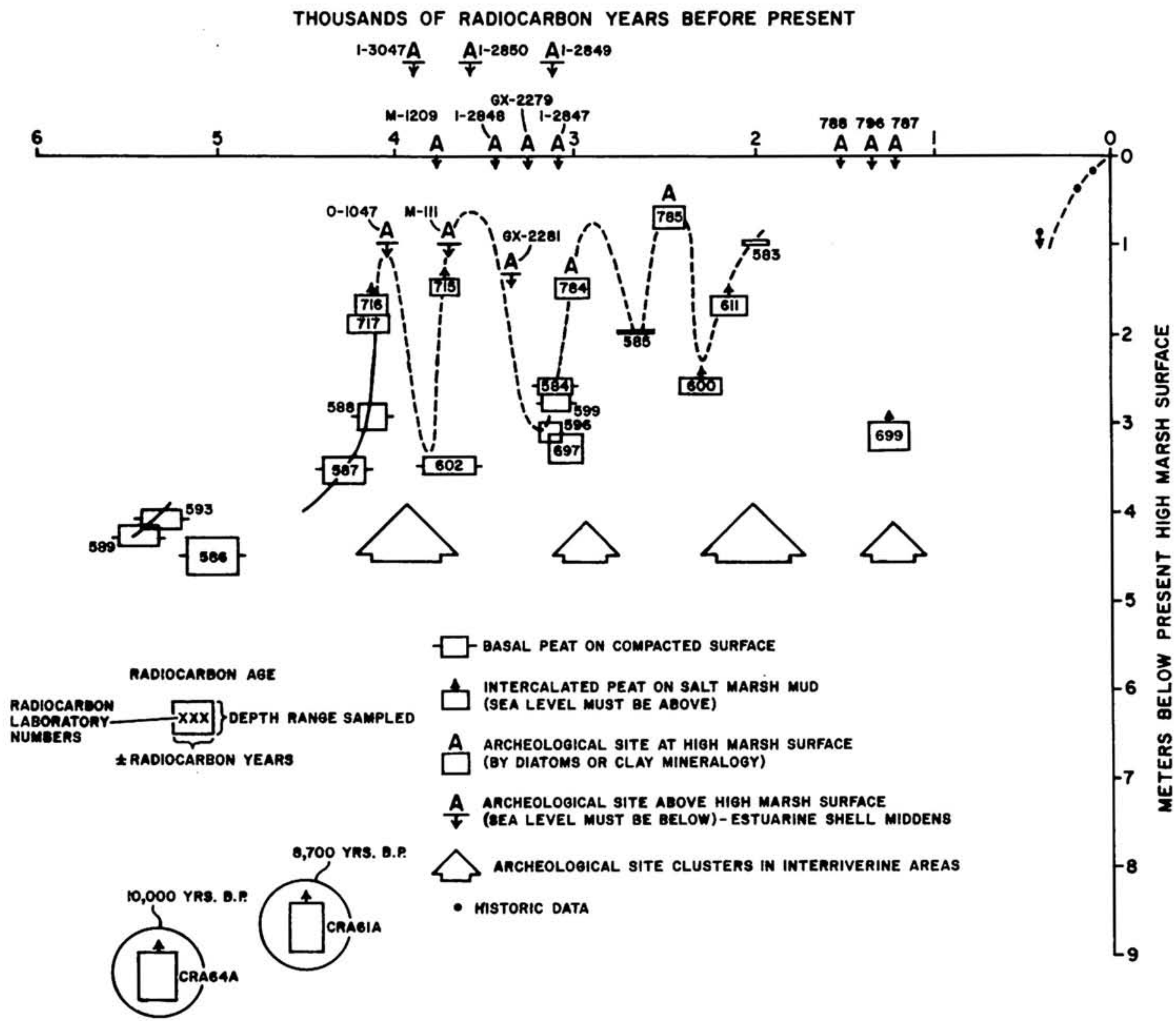


Figure 4. Preliminary sea-level curve for the South Carolina coast (after Colquhoun et al. 1980).

gressive-regressive cycles on the order of 400-600 years, then the Mississippian period largely coincided with a regressive interval (relatively lower sea level). What appears to be a dramatic decline in the use of the interriverine zone during the Mississippian period may in fact represent the areally extensive exploitation of nuts and deer during low sea level, resulting in few archeologically recognizable sites, a pattern like that observed for the Woodland period during regressive intervals. If the Mississippian period does coincide largely with a relatively lower sea level, then river swamps may not have been as extensive, or productive, as thought. On an overall comparative basis, however, sea level would still have been generally higher during the Mississippian period than during the Woodland. Consequently, as originally predicted, river swamps should still have been relatively more extensive, and productive, during Mississippian times, enabling the intensive exploitation of riverine areas indicated by existing site-settlement data.

Archeological Testing Program

The research undertaken by the Institute of Archeology and Anthropology in the Cooper River Project area bears on the above model of subsistence change, providing an opportunity to begin testing it in an area about which little is known. The analysis of two sites focused on the Middle-Late Woodland component at 38BK236 and the Mississippian component at 38BK235. These data are used to address specific spatial and temporal aspects of the model.

The Hypothesis

The basic research hypothesis generated by the model is as follows.

> Within the interior Lower Coastal Plain of South Carolina, the Middle-Late Woodland settlement patterning represents a diffuse or generalized subsistence economy, involving exploitation of riverine and interriverine resources, whereas the Mississippian settlement patterning represents a focal subsistence strategy, involving primarily the intensive exploitation of a relatively narrow range of specific, high density, seasonal and year-round riverine resources (principally those obtained from the river swamp).

The terms "focal" and "diffuse" follow from generalizations about the evolutionary consequences of different adaptive strategies. Flannery (1965) coined the term "Broad-Spectrum Revolution," referring to the observed worldwide phenomenon in which hunter-gatherers adopted an increasing variety of subsistence resources, presumably as a means of increasing production in response to population growth (See Christenson 1980: 38). With the exceptions of scheduling conflicts (Flannery 1968) and extinction-overexploitation, strategies are usually added rather than substituted. Accordingly, and of significance to those concerned with the origins of agriculture, agriculture is viewed in this context as initially just another addition to expand production. Under conditions of increasing population, agriculture would be increasingly emphasized because of its potential for intensification. Thus, from a general evolutionary perspective, there is a trend from a focal hunting-gathering economy to a diversified hunting- gathering economy and eventually to a focal agricultural economy (Cleland 1976).

In order to explain systemically this observed sequence, Christenson (1980) builds an economic-ecological model of subsistence change that employs the concept of food niche width, an index of evenness of resource use varying from 1.0, where only one resource is used, to n, where all resources are used in equal proportion (Hardesty 1975; Christenson 1980: 34). According to Christenson (1980: 36-37), when population densities are low, the food niche width will be narrow and resource diversity low. Resource diversity is the number of different resources consumed regardless of their proportional contribution to the diet. The low resource diversity reflects concentration on a few low-cost animal and plant resources. Labor efficiency is high at this point. As population grows, initial resource selection is intensified and new higher-cost resources are added. The food niche width is now broader, resource diversity higher, and labor efficiency lower. If cultivation is adopted, wild resources will decline proportionally in use, but will not be dropped except in cases of high population density, overexploitation or scheduling conflicts, in which case, niche width could decrease dramatically. However, even though the economy is specialized, i.e., agrarian, the exploitation of a diverse set of resources can cause low labor efficiency.

Based on Christenson's model, the resource diversity, or number of species that were exploited in the South Carolina interior Lower Coastal Plain by Middle-Late Woodland and Mississippian populations, may have been similar. It is proportional use of resources that would be expected to differ. The hypothesis identifies the resources that would exhibit differential use. Although both populations exploited riverine resources, the proportion of riverine-associated resources represented in a Mississippian subsistence economy is expected to be higher. Furthermore, if use of riverine resources increased in the Mississippian period, the resource diversity and even niche width may have increased over the preceding period. Whether or not the focus on riverine resources included cultigens, which could effectively decrease niche width, remains to be seen.

Site-Level Hypotheses of Middle-Late Woodland and Mississippian Subsistence Change

The level of data integration within the model is greater than that represented by any one, or even several, sites. Therefore, in order to test the hypothesis with relevant site level data from 38BK235 and 38BK236, both of which are located in a riverine setting, a series of corollary hypotheses was derived.

CH_1 A given Middle-Late Woodland site (e.g., 38BK236) will exhibit less resource (subsistence) variability in terms of species diversity and frequency than a Mississippian site (e.g., 38BK235).

This first hypothesis is the only one that relates to the direct measure of subsistence resources used. Based upon the model, the full range of resource diversity would not be expected at any one Woodland site, possibly not even one Mississippian site. However, assuming that riverine Mississippian sites (i.e., 38BK235) are more likely to represent intensive year-round (at least multiseasonal) habitation, it is expected (test implication 1) that the number of resources and representation of the riverine resources present, barring differential preservation, should be greater than at riverine Middle-Late Woodland sites (i.e., 38BK236). The reconstruction of the late prehistoric environment and the identification of cultural selectivity are dependent upon specialized floral and faunal analyses.

CH_2 Middle-Late Woodland artifact assemblages will exhibit lower overall diversity in forms (i.e., fewer types, with multiple uses for each type), while the Mississippian assemblages will exhibit higher overall diversity (i.e., increased functional specificity). While the use-functional variability per artifact is expected to be higher in the Middle-Late Woodland period than in the Mississippian, the actual number of artifact types within a Middle-Late Woodland assemblage is expected to be lower, and hence exhibit a lower diversity index than the Mississippian.

This hypothesis, and the others which follow, depend upon indirect, archeologically derived measures of subsistence activities. Christenson's (1980) discussion of niche width and resource diversity does not relate directly to artifact assemblages. One of the few archeologists to connect an economic discussion with assemblage expectations is Cleland (1976). He suggests that in a diffuse adaptation, where a variety of resources is being exploited, the tool kit might be expected to contain a wide variety of tools capable of performing a diverse number of functions (1976: 64). However, based on Christenson's (1980) study, it cannot automatically be assumed that the Middle-Late Woodland populations exploited a greater number of resources than the Mississippian populations, thus implying an assemblage containing a greater number of tool forms. In fact, the very nature of riverine intensification may foster the production of an increased number of tools for specialized extraction. Thus, a greater number of tools may be present in the Mississippian assemblages. More specifically, Cleland (1976: 62) expects focal tool kits to exhibit limited functional categories. This is not to say that there will be limited variability in tool forms or styles but that there should be "...reduced variability in tool form paralleling limited functional categories" (1976: 62). He further explains that "...while only a small number of tool kits may be employed, tool production is often prodigious" (1976: 62).

Cleland (1976: 64) expects tool kits associated with diffuse subsistence economies to demonstrate a variety of tool functions, reflecting the greater variety of resources being exploited. He states that "...this does not necessarily imply an expanded inventory of tool forms or styles...(but) there is an increase in the variability of tool-form paralleling that of function" (1976: 64). This, then, should be reflected in the archeological record by the presence of "...tools that perform very diverse functions, as well as a great variety of tool kits" (1976: 64).

Cleland notes that diffuse adaptation requires a high degree of mobility, which may necessitate a compromise over the number and/or type of tools that can be efficiently transported. Recent investigations of this problem by Goodyear (1979) and others researching early focal adaptive strategies (i.e., exploitation of a narrow range of resources) suggest a high degree of curate behavior for highly mobile populations. That is, tools were fashioned from high grade raw material, and were used to perform a number of activities until their use-life was exhausted. Fewer numbers of tools may be present in an assemblage associated with mobile populations exploiting a multiresource base (i.e., Middle-Late Woodland populations). More localized or sedentary populations exploiting a multiresource base (i.e., Mississippian populations) would not necessarily be as restricted in terms of artifact portability, and thus, a greater number of tools may be present in the assemblage.

In light of the above discussion, it is expected (test implication 1) that Mississippian (focal) tool kits will exhibit more distinct, specialized, single-function tools as reflected in the types of observable use/wear modification. Conversely, Middle-Late Woodland (diffuse) tool kits are expected (test implication 2) to exhibit relatively fewer tool types with multiple uses per tool; that is, more use/wear types should be found per tool, indicating multiple tool use.

While Cleland's discussion appears particularly applicable for the analysis of lithic tool assemblages, it has equal relevance for the analysis of the ceramic assemblages (test implication 3) in that less structural variability is expected in Middle-Late Woodland pottery than Mississippian. Even though many of these expectations may appear obvious and clearly demonstrable, the definition and characterization of an entire assemblage in order to show subtle functional differences in use/wear patterns or morphological properties is methodologically difficult, especially if the sample size is small and if spatial and temporal associations are indistinct.

CH_3 The artifact assemblages of the Middle-Late Woodland populations will exhibit less utilization of nonlocal raw materials than will the Mississippian assemblages.

CH_4 The Middle-Late Woodland assemblages will demonstrate less selectivity within the range of available local raw materials than will the Mississippian assemblage.

These two hypotheses pertain to the quality of clay and lithic raw materials available to the local inhabitants. With an increase in specialized activities during the Mississippian, there should be an increase in the use of materials better suited for efficiently performing specific functions. It would become increasingly beneficial to obtain higher quality materials of nonlocal origin. In a comparative sense, the Mississippian assemblages should show higher frequencies of better quality, nonlocal raw materials (test implication 1), a higher incidence of their curation due to specialization (test implication 2), and better manipulation of local materials in terms of selection and technological enhancement (test implication 3).

For the lithic materials, there are obvious differences between the local orthoquartzite and the more silicious, cryptocrystalline materials occurring outside of the immediate area. The subtle differences within the orthoquartzite outcrops in the local area have been examined by Anderson, Cantley, and Novick (1982). The ceramic technology is less obvious. A compositional analysis of both the unmodified clays and the ceramic sherds from sites 38BK235 and 38BK236 helps characterize the local clay sources and begins to isolate distinctive treatments in terms of tempering, firing, and other modifications.

CH_5 There will be fewer and less functionally distinct activity loci in Middle-Late Woodland sites than Mississippian sites.

Functional analyses of lithic artifact assemblages, ceramic distributions, identification of food resource remains, and an examination of soil differences (pH, grain size, phosphate content, etc.) contribute to the reconstruction of activity areas. Functionally derived elements in artifacts should distribute more randomly in terms of activity loci in the Middle-Late Woodland (test implication 1). This implication suggests that due to the rather limited nature of the Middle-Late Woodland occupations, different artifacts are likely to occur anywhere on the site. Computer mapping visually aids the definition of assemblage and feature associations.

In addition, ceramic vessels display distinctive formal elements, e.g., complicated stamped may be associated with any number of different activities. It is expected that formal elements may begin to be associated with activity areas in a nonrandom manner in the Mississippian period due to two factors: (1) repetition of the same activities, at the same site, over a period of time may bring about intrasite patterning with specific types of vessels becoming associated with specific activity areas, and/or (2) a larger population concentration may necessitate coding or patterning of information to help identify an associated function or group (Wobst 1977). Furthermore, more formalization in the distinctive use of areas may be reflected in the Mississippian by more: (1) bounded space (test implication 2), (2) specialized features (test implication 3), and (3) spatially discrete associations of specific artifact assemblages as well as floral and faunal subsistence remains (test implications 4).

Although 38BK235 does seem to have more well-defined features, the settlement pattern probably exhibits no more complexity than a homestead or plantation. The possible structure at 38BK236 could represent a Woodland settlement on the same order. Thus, while the feature data are less well-defined, the artifact analysis may indicate more discrete patterning at 38BK236 than 38BK235 due to the smaller number of tools and vessels in use at the former site.

CH_6 Middle-Late Woodland sites will exhibit less intensive habitation than Mississippian sites.

This hypothesis is based on evidence presented earlier that Middle-Late Woodland populations were seasonally dispersed at a number of riverine and interriverine settlements, whereas Mississippian populations were concentrated throughout the year at fewer settlements within the riverine zone. Under conditions of intensive habitation, defined here as sustained population concentrations at a given settlement (site), a broad range of behavioral activities is expected (see House and Wogaman 1978, for a detailed discussion of correlates of intensive habitation, most of which are presented here as test implications). Archeological measures of these activities should indicate more intensive habitation at Mississippian than at Middle-Late Woodland, riverine sites.

Basic to any consideration of intensive habitation is whether or not the site catchment (environment within the vicinity of a given site--Jarman, Vita-finzi, and Higgs 1972) was capable of supporting sustained population concentrations. Therefore, environmental correlates of site location and intensive habitation must also be derived and measured.

With the above factors in mind, the following test implications for this hypothesis involve comparative, archeological and environmental measures of intensive habitation for Middle-Late Woodland and Mississippian sites in riverine environments. Accordingly, it is predicted that relative to population size and preservation factors, Middle-Late Woodland sites were not as intensively occupied as Mississippian sites, and therefore, should exhibit: (1) fewer and less variable archeological remains, indicating relatively few people, short duration of occupation, and/or a relatively narrow range of behaviorial activities; (2) fewer nonportable artifacts, such as large storage vessels; (3) more uniform densities of archeological material over the site, indicating fewer behavorial activities, less well-defined activity areas, and the discard of materials in use areas; (4) less evidence of multiseasonal use, as indicated by economic and non-economic floral and faunal remains; and (5) smaller sites, less advantageously located in terms of adequate, fairly level living space, close proximity to a permanent, freshwater source, and considerable environmental diversity in the site catchment area.

In contrast, intensive habitation should produce greater variability in the densities of archeological materials over the site due to more and better defined (including more bounded space) activity-specific use areas. Furthermore, with intensive habitation, there should also be greater spatial variability in archeological materials by size, with larger discard items being moved out of the way, either through tossing or being carried to dumping areas (Murray 1980). Intensive habitation, involving long-term population concentrations, would also necessarily exhibit evidence of multiseasonal use.

Summary and Conclusions

Changing emphases in the theoretical orientation of the archeological discipline, affected by and directed toward investigations of previously unknown areas, have required new modeling frameworks. Specifically, work away from obvious or known archeological centers has oriented thinking away from normative concepts. No longer are groups living in marginal areas viewed as poor adaptive imitators. The inhabitants of the South Carolina interior Lower Coastal Plain appear to have been basically self-sufficient. Consideration of adaptation in the interior is a necessary counterpoint to modeling late prehistoric coastal adaptation.

Within the interior, subtle differences involving scale and emphases are evident. The hypotheses are quite general, meant to help define the archeological assemblages at sites 38BK235 and 38BK236 through a comparative framework. Although an effort has been made to specify some of the expectations or test implications by discussing the nature of the subsistence activities, there has not been enough research conducted, to date, to refine further the questions and implications. This situation is not only true for substantive information concerning the interior Lower Coastal Plain of South Carolina, but holds true for such methodological concerns as deriving functional properties from sherds when whole vessels are not available. The most difficult aspect of this research is the development of procedures necessary to identify and relate the functionally derived attributes of entire archeological assemblages to subsistence activities.

CHAPTER 3

FIELD RESEARCH AND INTERPRETATION AT 38BK235 AND 38BK236

Introduction

Adequate testing of the site-specific corollary hypotheses depends on the nature and integrity of the site data: for the degree to which data recovered from 38BK235, especially from a Mississippian context, can be contrasted with data recovered from 38BK236, in a Middle-Late Woodland context, is the crux of the analysis. That is, within the riverine zone, differences in subsistence remains and functionally related assemblage data between sites from these two periods will provide evidence for subsistence change. This analytical contrast was not originally anticipated. Only a few sites with substantial surface expressions were chosen for intensive investigations in the mitigative phase. As might be expected from the model, sites with greater assemblage diversity and density are positioned within the riverine zone, along the terrace of the Santee River. Information from sites dating to the same time period, but located in different environmental zones, would have provided complementary functional distinctions in subsistence exploitation patterns related to the interriverine and riverine zones.

In the absence of any known comparable sites on the interior Lower Coastal Plain of South Carolina, sites 38BK235 and 38BK236, located in the riverine zone, have the advantage of containing feature data and exhibiting preserved plant and animal remains with which to address subsistence-settlement change. The disadvantage lies in their multicomponent assemblages. Unlike riverine deposits elsewhere, these components were not deeply buried or stratigraphically separated. Of primary concern, then, to the functional analysis is the identification and interpretation of artifacts and features in datable context.

Both 38BK235 and 38BK236 exhibited artifacts, which on the basis of typological and stylistic attributes, span the Early Archaic through the Mississippian periods. All of these artifacts lay in shallow deposits which extended no more than 30 cm in depth. The vegetation cover indicated that the sites had probably not been disturbed by modern cultivation since the turn of the century, though root disturbances from recent timbering activities were evident. Horizontal separation and superposition of features and subfeatures were subsequently recognizable, but the very shallowness of the deposits precluded definition of stratigraphic cultural units during excavation.

Osteological materials recovered from 38BK235 could not be radiometrically dated; they had been burned at such a high degree initially that no collagen remained (D.F. Smith 1981). There were not enough data to submit radiocarbon samples in order to date 38BK236. Thus, the investigators were forced to rely on traditional typological chronologies when recording site artifacts and site features.

Whether the traditional regional typologies are well-enough refined to separate valid temporal components is arguable. Due to lack of previous research in the area, the local variation in material and form has not been typologically identified for an interior coastal, cultural-historical sequence, nor are the data from 38BK235 and 38BK236 particularly suited for this purpose. Anderson and others (1981) attempt chronological ordering of data from sites better suited to such an analysis. Based on a combination of stratigraphic and radiometric determinations, coupled with judgmental and statistical manipulations, they expand traditional ceramic and lithic typologies to incorporate local varieties found at the three Mattassee Lake sites. The traditional typologies used herein have been defined originally on the outskirts of the state along the North Carolina, Georgia, and Florida coasts (e.g., Caldwell and Waring 1939; Sears and Griffin 1950; Williams 1968; South 1960, n.d.; Milanich 1973); the North Carolina and Georgia Piedmont (e.g., Coe 1964; Wauchope 1966); and along the Savannah River (e.g., Caldwell and McCann 1941; Stoltman 1974). At this larger regional scale, the typological representatives discussed in both reports are in basic agreement (Anderson, personal commmunication). Furthermore, the analysis of hafted bifaces from 38BK235 supports the definition of a Santee stemmed point in a late context (Appendix C).

The preservation of features, biological remains, and a high frequency of complicated stamped and burnished wares at 38BK235 argue for a significant late prehistoric or Mississippian occupation. The pottery wares represented at 38BK236 span the Late Archaic ceramic through the Mississippian periods, the greatest frequency falling in the Middle-to-Late Woodland periods associated with the major feature. As more radiometric dates accumulate, there is evidence that many of the distinctive surface treatments, e.g., simple stamped, check stamped, complicated stamped, etc., persisted as local variants for longer periods of time, proving less temporally circumscribed than originally thought. For this reason, the occupation at 38BK236 has been generalized to a Middle-Late Woodland period with no attempt to separate the few seemingly earlier or later materials for the functional analysis. The hafted bifaces were singularly uninformative as to time, since recent functional considerations of lithic materials suggest that functional and technological performances greatly affect morphological forms. Thus, a functional approach also has implications for chronological assessments. For example, temper type and temper sizing may be technologically and functionally determined. Control of both functional and chronological attributes and features is necessary to answer completely subsistence-settlement questions. The following site interpretations approach the site features and assemblage data functionally in order to begin isolating these contexts.

In the succeeding discussion, the excavation and description of each site is presented separately. A comparative summary addresses the nature and extent of the occupations, which will be elaborated by the analyses of the ceramics, lithic, and paleoecological data following in subsequent chapters. Testing and excavation phases were performed sequentially with no intervening analytical stage. Funding and time constraints in the excavation and analysis of the project data continually forced adjustments in the scale and focus of the inquiries. The result is a compromise between broad, often unrefined questions and narrow data sets, mediated by methodological concerns involving field logistics, personal expertise, and the current status of the discipline's methods and techniques.

38BK235

Physical Characteristics

This large, multicomponent site was situated along the sloping Santee Swamp bluff edge in what Brockington (1980) refers to as the ecotone zone (Figs. 2, 3). Soils on the site were characterized by relatively deep, well- to moderately well-drained loamy sands of the Norfolk and Bonneau soil series (Charles E. Glove, Jr., personal communications; Berkeley County Soil Survey 1980). These soils typically produce the high densities of mixed hardwoods and long-leaf pines that were observed on the site prior to its destruction.

From its position overlooking the Santee Swamp, site 38BK235 rose gently from about 8.5 meters above sea level at the bluff or terrace edge to approximately 13 meters at its most southern extent. The site extended approximately 360 meters along the bluff and 89 meters north-south.

Two small streams which flowed around the edges of the site emptied into a large, marshy pond 300 meters northward in the Santee Swamp. One stream flowed approximately 150 meters northwest of the western end of the site; the other, smaller stream ran 30 meters south and east of the eastern end of the site.

Phase I (Intensive Testing)

The intensive testing phase at 38BK235 was divided into three parts. First, a bulldozer cut was made along the terrace edge (Fig. 5--northern most access road). Second, (a) a permanent site transit station was established at grid location 100S, 100E, (b) a contour map of the site was prepared, and (c) the site grid system was established. Third, a series of 1 x 1 meter subsurface test excavation units was systematically placed over the site.

An International Bulldozer (TD25C) was used for all cutting and grading performed during the testing and excavation of all four sites. One by one meter excavation units were selected as the basic excavation unit throughout all phases of investigation at the four sites. Units of this size provide good horizontal control yet are small enough so that a number of them can be excavated and screened rapidly. By contrast, they are large enough to detect even relatively low artifact density areas. The use of 1 x 1 meter units as the standard unit throughout all phases provided for the collection of comparable data, as did routine screening of material through one-quarter inch hardware cloth. More refined recovery techniques were used as warranted.

The bulldozer cut facilitated access to the site in an area characterized by dense vegetation, making the movement of field crews, site mapping, and the systematic on-the-ground location of test units much easier. Materials exposed by the cut, which was 10-20 cm deep, were systematically

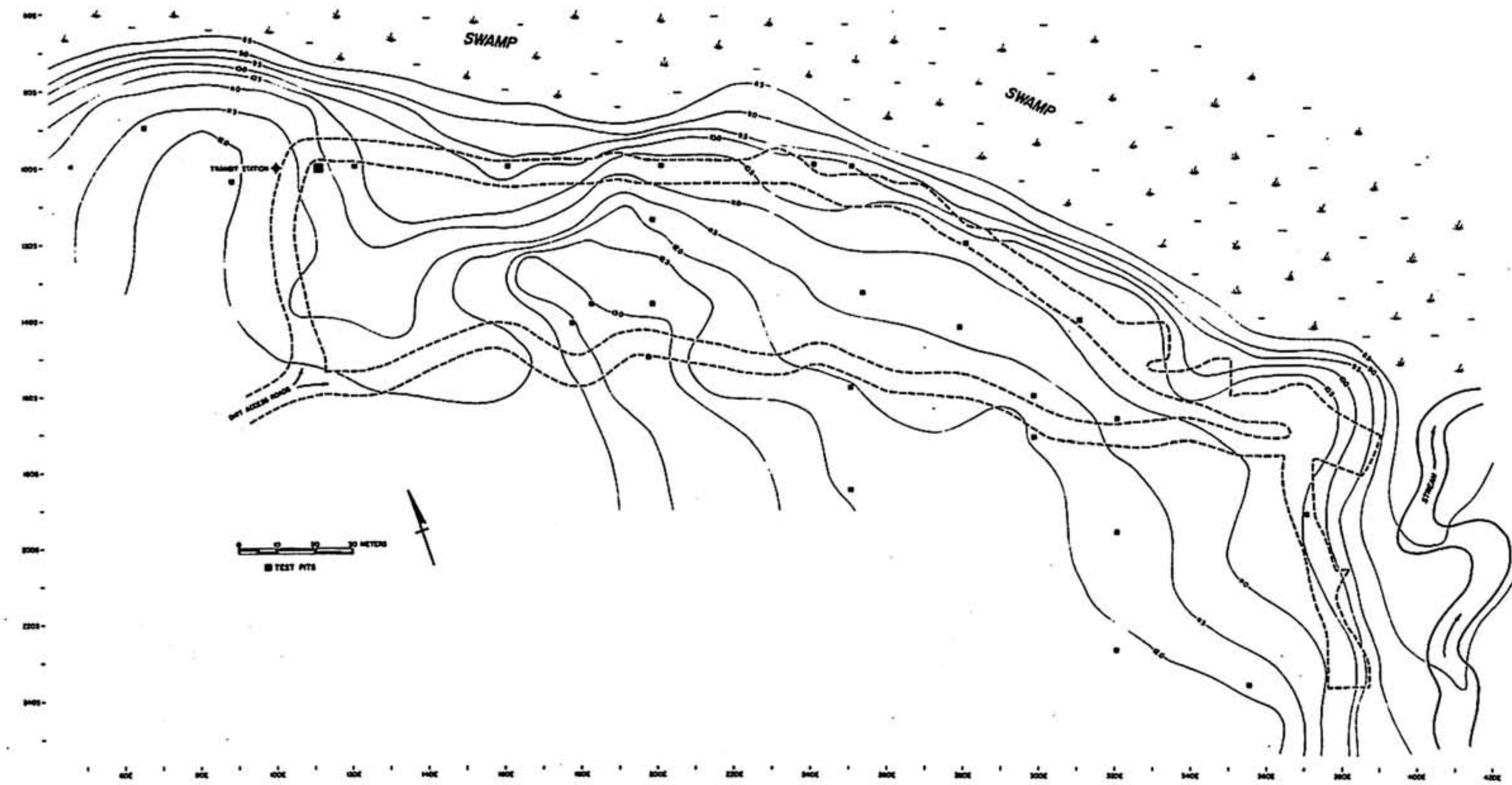


Figure 5. Site 38BK235: contour map showing location of Phase I, intensive testing units.

collected at intervals of 20 meters. These collections provided considerable insight, subsequently confirmed by subsurface testing, into the relative temporal and spatial distribution of materials over the site. The collections indicated that (1) the site was used from Early Archaic through Mississippian time; (2) the Middle-Late Woodland (as indicated by Deptford and Cape Fear/Wilmington ceramics [South 1976]) and Mississippian periods (Chicora and York ceramics [South 1976]) were most heavily represented; (3) the eastern two-thirds of the site within 60 meters of the bluff's edge contained the highest densities of ceramic and lithic material; and (4) Woodland materials tended to concentrate toward the western end of the site; Mississippian, toward the eastern.

In large part, these findings, and those from the subsurface testing, support Brockington's (1980) impressions resulting from his reconnaissance survey. Brockington suggests that 38BK235 probably represents a series of small, temporary camps located in a favorable environment. While this may be generally true, the Mississippian component, which was not discovered until the intensive testing phase, appears to represent a more substantial occupation. This is subsequently confirmed by Phase II investigations.

Using the bulldozer cut as an origin for north-south transects for the systematic placement of 1 x 1 meter subsurface testing units, north-south transects were spaced 40 meters apart with excavation units at 20-40 meter intervals along the transects. Additional supplemental test excavations were placed in areas of noticeably high artifact density, increasing the dispersion of sample points. The eastern two-thirds of the site had the greatest densities of material and, therefore, received greater emphasis: 22 of 31 test units (Fig. 5).

The subsurface excavation units at 38BK235 during this phase varied from about .30 to 1.20 meters. Soils at the higher elevations (south central portion of the site) tended to be quite shallow, with red-orange sandy-clay substrate close to the surface. By contrast, soils along the bluff edge were quite deep, often exhibiting evidence of colluviation and/or alluviation.

With one exception (Feature 1--to be discussed), the stratigraphy in all Phase I excavation units was the result of natural soil formation processes. Therefore, the units were excavated in arbitrary 10 cm levels. The top 5-10 cm (O_1 and O_2 soil horizons) is a loose, medium gray, loamy sand-humus zone. Soil horizon A (transitional zone) was usually between 10 to 30 cm below surface. This soil horizon was typically more compact, moister, with a medium gray-tan, loamy sand of the fine-to-medium texture. Soil horizon B typically started at about 30 cm below surface. It was generally a medium-tan soil becoming (with depth) a moister, more compact, coarser-grained, lighter-colored (yellow to white) sand. Soil horizon B often contained fossil marine shells, indicative of reworked Pleistocene sands (Colquhoun, U.S.C. Geology Department, personal communications; Data Supplement III), and overlay an undulating red-orange, sandy-clay substrate at highly variable depths.

Cultural material was concentrated within the top 40 cm in the A and upper portion of the B soil horizons. Notable exceptions to this were observed to occur in the units along the bluff edge. Here, because of alluviation and colluviation, materials was often deeply buried, at least to depths of 1.20 meters. Nevertheless, superposition of materials by time period was not evident. That is, test pit data indicated that temporal variability over the site was more horizontal than vertical.

Phase II (Block Excavations and Grading)

Introduction

During subsurface testing in Phase I, a Mississippian-period hearth (Feature 1) and two relatively dense lithic concentrations were encountered toward the eastern end of the site. In Phase II these areas were investigated in Block Excavation Areas 1 and 3 respectively (Fig. 6). Block Excavation Area 2 was opened in another area of lithic concentration, located at the western end of the site (Fig. 6). The digging of Block Excavation Area 1 exposed a substantial Mississippian-period structure (Feature 7) and other associated features (Features 2-6 and 8-12; Fig. 7; Table 1). Following completion of Block Excavation Areas 1 and 3, and operating under the assumption that Feature 7 may not have been an isolated occurrence, the area east and south of Block Excavation Area 1 was carefully bulldozed to remove the dense vegetation. The area was then graded, exposing additional structures and features (Features 13-18; Fig. 6; Table 1). Block Excavation Area 4 was initiated for removal of Feature 14. Controlled surface collections (20 x 20 m blocks) were made after rain had fallen on the completely graded surface.

All Phase II investigations were tied into the Phase I grid system. However, for convenience and more precise horizontal and vertical control, a local datum (transit station) was established at 164S, 305E, adjacent to Block Excavation Area 1. Unless otherwise noted, excavation units, typically 1 x 1 meter units, were excavated in arbitrary 10 cm levels. The soil was removed by "shovel skimming" and processed through one-quarter inch hardware cloth. Standardized 10-liter soil samples were taken from features for later flotation recovery of macro-floral and -faunal remains and for specialized pollen, phytolith, and soil chemistry analyses. Features were cross-sectioned and/or completely excavated. Subfeature designations were given to features associated with major structures or pits. Modifications of these basic procedures were determined primarily by the nature of the specific features encountered.

Block Excavation Area 1

Feature 1 (the hearth discovered in Unit 159-160S, 298-299E during Phase I) and the abundance of associated Mississippian ceramic and lithic artifacts, in addition to some floral and faunal remains, suggested a substantial occupation involving a structure, or at least a major activity area. Therefore, the purpose of Block Excavation Area 1 was to investigate the probable Mississippian structure(s) and/or activity area(s) associated with Feature 1.

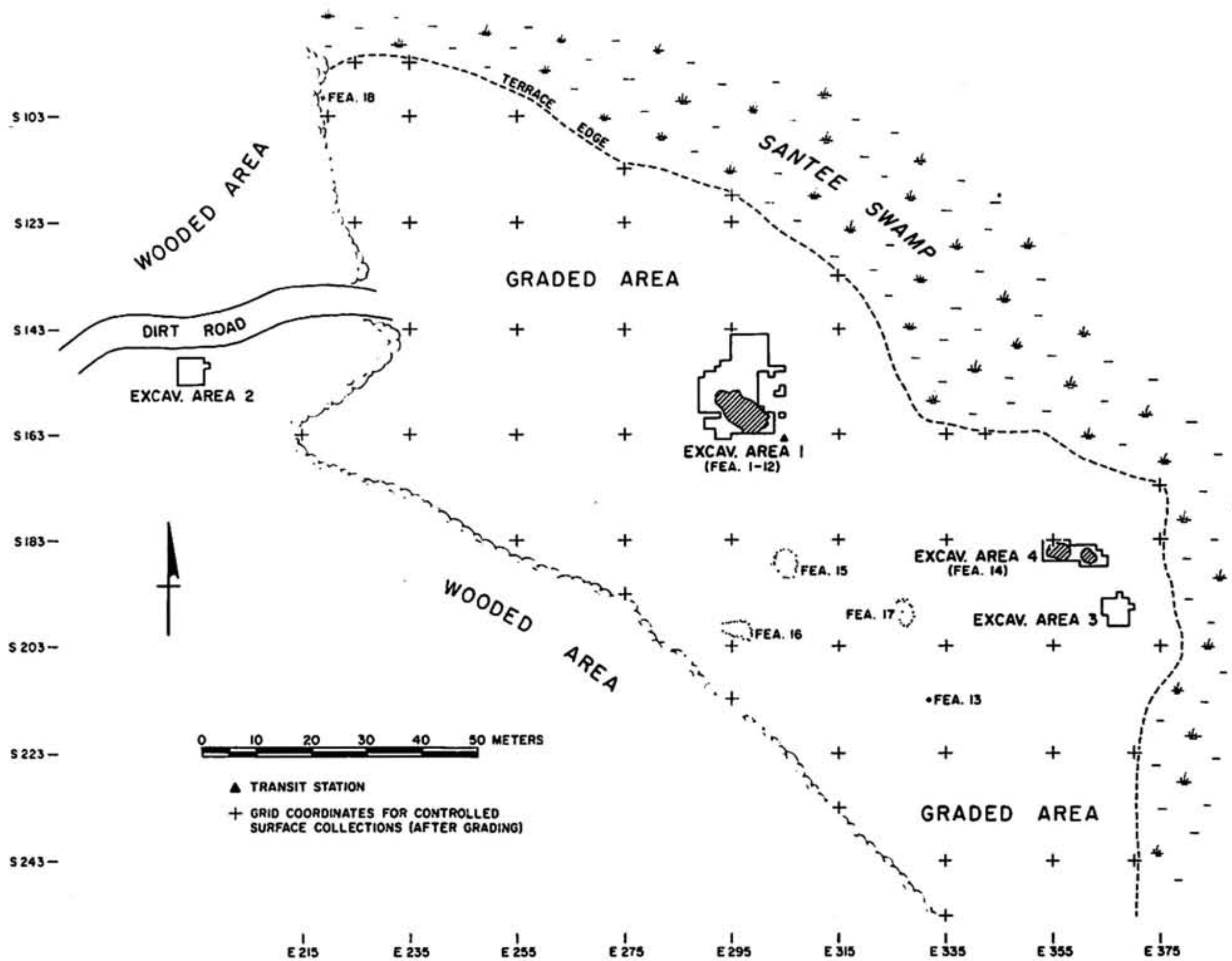


Figure 6. Site 38BK235: map showing location of Phase II excavation areas, graded areas and features.

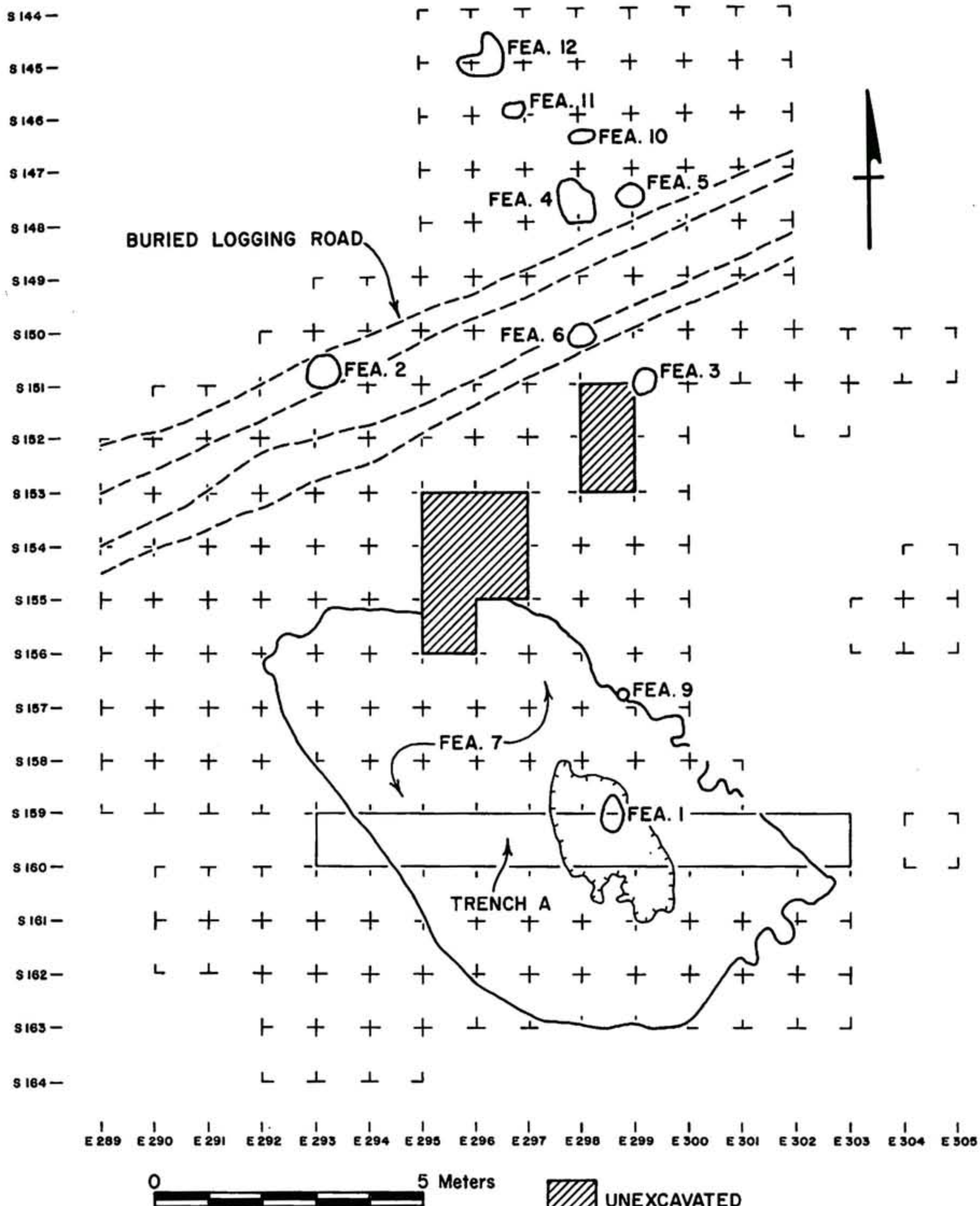


Figure 7: Site 38BK235: map showing Block Excavation Area 1 with locations of Features 1-12.

The initial excavation unit was expanded into Trench A in order to delineate the east-west extent of the occupation level, or floor, of Feature 7. Contiguous 1 x 1 meter units were then excavated to a depth of ca. 20 cm, i.e., to the top of Feature 7, in order to expose the entire feature. In the process, Features 2-6 and 8-12 were discovered. Ultimately Block Excavation Area 1 consisted of 181 more-or-less contiguous excavation units (Figs. 7, 8).

Figure 8. Site 38BK235: Block Excavation Area 1. View looking northeast.

Minus the Feature 7 occupation level, the Trench A profile (Fig. 9) is fairly characteristic of the natural stratification in the area of Block Excavation 1. There was no observable vertical separation or superposition of archeological material by temporal period, either stratigraphically or typologically. Although archeological material was encountered at all depths, from the ground surface to the top of the orange-brown, sandy-clay substrate, most material was concentrated between 20-30 cm (Level C) below surface in soil horizon A (labelled B in Fig. 9). The vast majority of the ceramic and lithic artifacts is attributable to the Mississippian period. However, typologically earlier material (primarily Woodland) is also present. The apparent tendency for materials of all temporal periods to be near the surface, in conjunction with heavy root and modern disturbances (e.g., the buried logging road in Fig. 7), more than likely accounts for the obliteration of any stratigraphic separation of materials that may have been originally present.

Within Block Excavation Area 1, Feature 7 is the primary feature (Figs. 7-11; Table 1). It represents a structure with an associated living floor, a hearth (Feature 1), and postmolds (Subfeatures 7A-7EEE and Feature 9, which in subsequent excavation proved to be a postmold). The midden staining was contained or bounded; that is, it was definitive and not spread amorphously over the area. Neither oval nor rectangular (but reminiscent of both) its maximum dimensions measured 10.5 x 6 meters. There was an undefined area between the rock and Subfeature CCC along the southwestern line of posts (Fig. 12). This gap may represent a possible entryway. If so, a southwestern exposure would be advantageous in a fall-winter settlement. Both ceramic and lithic artifacts were more heavily concentrated in this area (Chapters 4, 5), which might indicate an area of more use or greater pedestrian traffic. Postmolds present around the edge of the structure did not appear at regular intervals, however. In the context of the midden stain, the definition of postmolds and even the hearth area was difficult to discern at the point of origin. As stated, complete definition of the feature was not achieved until the top 20 cm of disturbed soil was removed.

After the entire floor area had been delineated, it was shovel skimmed through its complete 5 to 10 cm depth. Artifacts and subfeatures exposed during this process were mapped, photographed, and removed. Soil samples were taken from each 1 x 1 meter unit inside Feature 7 at floor level, which was defined by a spatially well-delimited, compact surface with a definite postmold pattern around its edges (see Fig. 9 for soil description). The remaining floor level soil in each unit was screened. All soil from the subfeatures, including Feature 1, was saved for flotation and special analyses.

Due to the proximity of numerous examples of recently burned stumps, bone fragments, rather than wood charcoal, were submitted for dating after the specialized analysis was complete. Animal bone and charcoal obtained by flotation from Feature 1--hearth, Feature 1--fill, and Feature 7--fill, was submitted for C-14 dating (U Ga 3975). The paucity of material made the combination of these samples necessary. Unfortunately, these data were insufficient (D.F. Smith 1981).

Units outside Feature 7, which had been originally excavated to a depth equivalent to the top of Feature 7 floor level, were excavated in the same manner to comparable depth. Soil samples were removed from every other unit. The use of similar excavation strategies enabled inside/outside comparisons (for Feature 7) of the various data sets.

Features 2 and 3, upon removal, proved to be burned and rotted stumps. Similarly, Feature 8 was a circular root stain (Table 1).

Features 4, 5, 6, and 10 represent calcined human bone deposited in shallow pits (Figs. 7, 11; Table 1). Upon discovery, these features were left pedestalled by excavating the surrounding units to a depth below the bases of the features. The fill in Features 4, 6, and 10 was removed in 10 cm levels, and the entire contents were saved for flotation and special analyses. Feature 5 was removed from the field in its entirety. In order to determine whether or not the bone was distributed nonrandomly, it was "excavated" and mapped "piece-by-piece" in the laboratory prior to under-

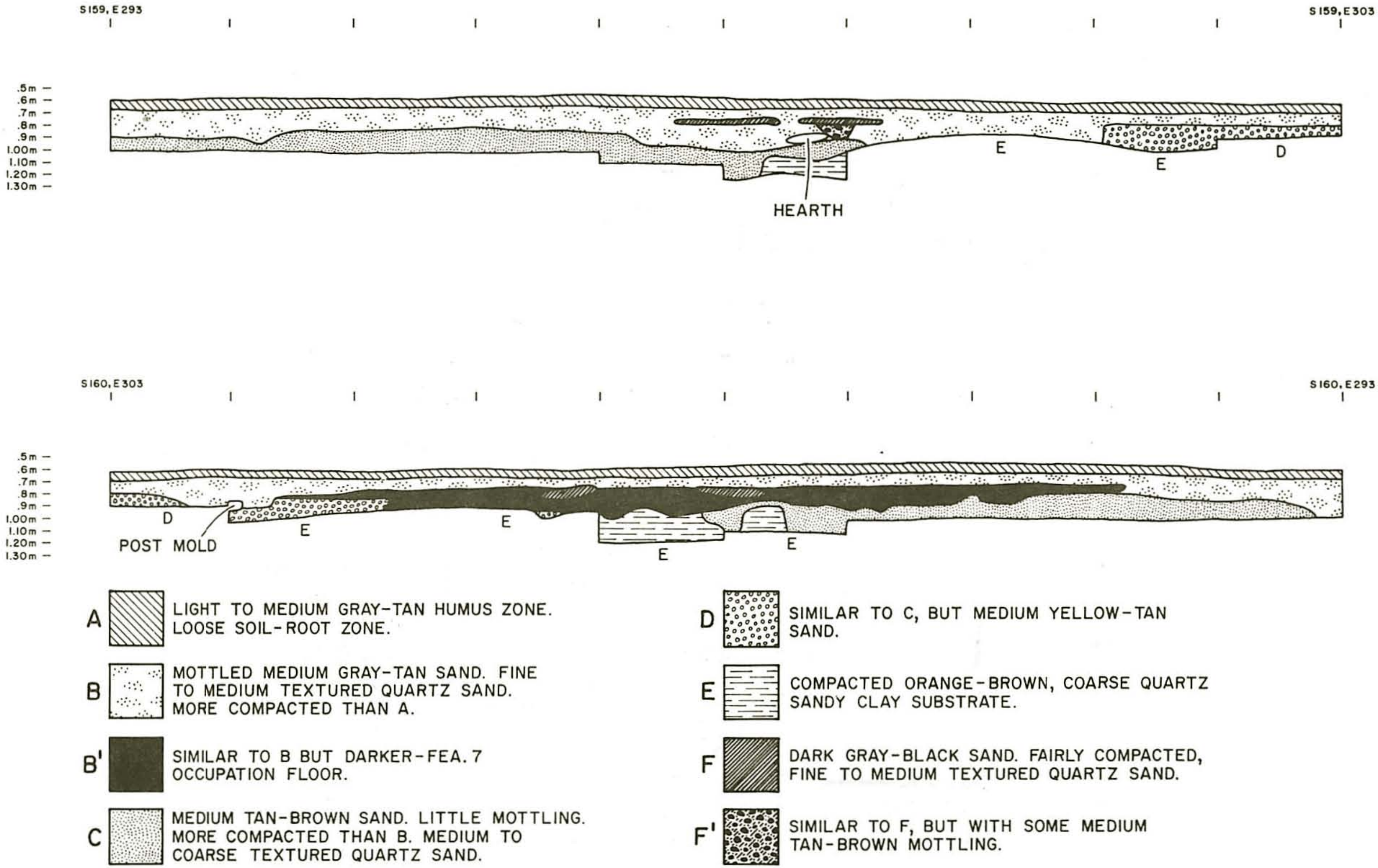


Figure 9. Site 38BK235: Block Excavation Area 1, Trench A profiles.

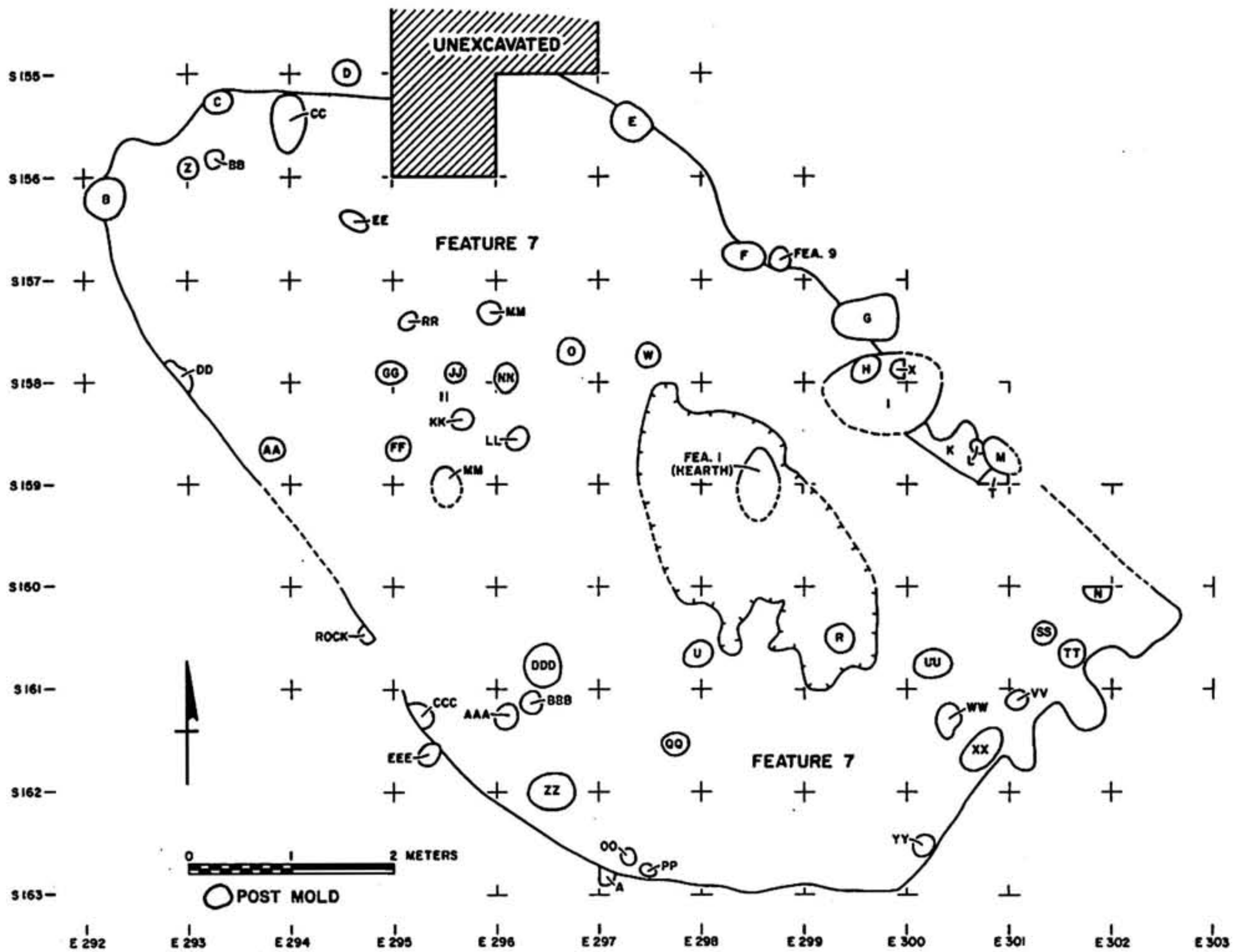


Figure 10. Site 38BK235: Block Excavation Area 1 showing location of Feature 7 (structure) and associated subfeatures.

going osteological analysis. No depositional patterns emerged, but five maypop seeds (identified by personnel at the Herbarium, University of South Carolina) and one triangular point fragment were discovered in the bone matrix. The soil was floated, and the contents subjected to special analyses. After the osteological analysis, bone from Feature 5 was submitted for C-14 dating (U Ga 3973). Again, the bone could not be dated because of insufficient collagen (D.F. Smith 1981).

Features 11 and 12 (Fig. 7; Table 1), upon excavation, proved to be portions of the same feature, which converged towards the base. This shallow pit contained primarily Middle-Late Woodland ceramics (Cape Fear/ Wilmington-Deptford), and based solely on typological grounds, appeared earlier than the other Mississippian-associated features. The feature fill was trowelled and removed in 10-cm levels. All exposed artifacts were mapped, and soil samples were saved from each 10-cm level for flotation and special analyses.

Block Excavation Area 2

During Phase I, intensive testing, a relatively high density of lithic material was recovered from excavation unit 197-198E, 149-150S. This concentration suggested a major lithic-reduction activity area. Consequently, in order to gain a better understanding of the intrasite patterning at 38BK235, a 5 x 5 meter block (148-153S, 192-197E) was excavated adjacent to the original 1 x 1 meter unit (Figs. 6, 12).

Block Excavation Area 2 consisted of 25 contiguous 1 x 1 meter units excavated to a depth of 40-50 cm by shovel skimming within 10 cm arbitrary levels. The soil was screened, and soil samples were obtained from a few arbitrarily selected squares and levels for flotation and special analyses. In the absence of identifiable midden deposits, more extensive sampling was unwarranted because the deep, sandy, acidic soils are highly subject to leaching, resulting in poor preservation.

The stratification of Block Excavation Area 2 was entirely natural and quite uniform throughout. The top ca. 10 cm consisted of a dark gray-brownish, fine-sandy humus, which then graded into a transitional A-horizon soil (depth of ca. 20 cm). At that point the soil became yellow-tan, a fine-to-medium tan, which continued down to 50 cm, where, with increasing depth, it became lighter, almost white.

Although there was no apparent vertical separation or superposition of archeological materials, the artifacts and lithic debitage were concentrated between 20 to 40 cm below the ground surface.

Lithic materials occurred in relatively high, though differential, densities throughout the block area; however, no obvious activity areas or features were evident. The lithic assemblage consisted primarily of orthoquartzite debitage and lanceolate bifaces in blank and preform stages of reduction. Morphologically, the lanceolate forms resemble the Guilford type. A few Middle-Late Woodland pottery fragments were in apparent association, a pattern similar to that observed at 38BK236.

Figure 11: Site 38BK235: Block Excavation Area 1, Feature 6 (burial).

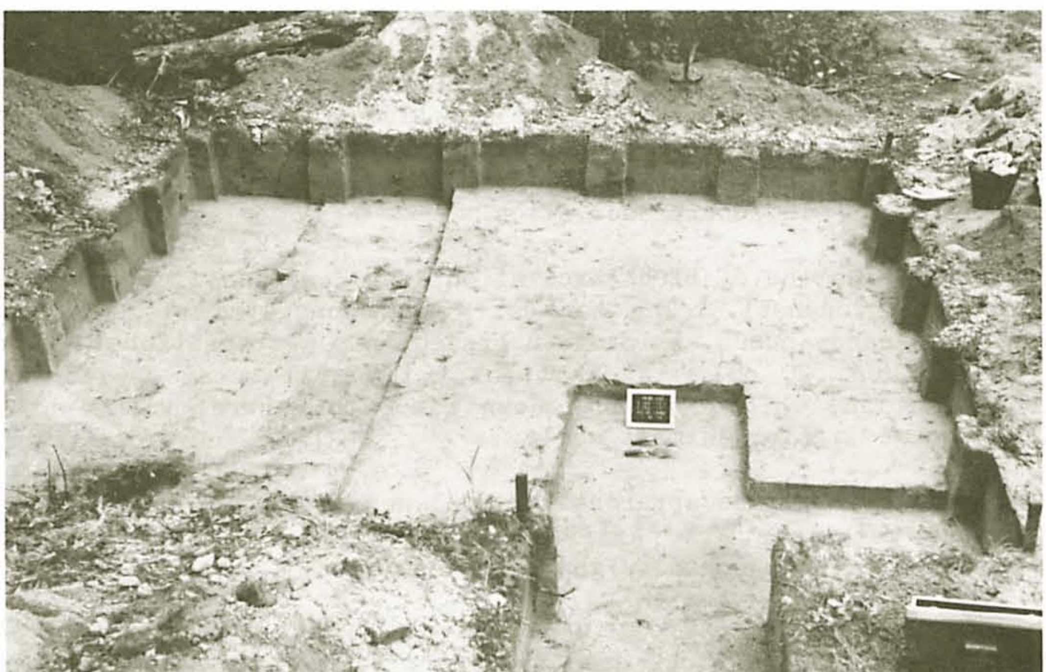


Figure 12: Site 38BK235: Block Excavation Area 2 at 40-50 cm, view looking west.

TABLE 1
38BK235

FEATURES 1-12

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
1	Hearth and associated shallow pit	Hearth-.70m Pit -3.0m	Hearth-.40 Pit -2.0	Hearth-1.92-2.02 Pit -1.90-2.05	Hearth-Lenticular Pit-Shallow basin	Hearth-Dark red-brown sand Pit-Dark gray-tan sand	1 unknown biface (orthoquartzite), 2 unfinished bifaces (orthoquartzite), 12 sherds of indeterminate ware, 1 Deptford sherd, 1 Cape Fear sherd, 9 indeterminate Mississippian	Associated with (in side) Feature 7 -structure
2	Burned stump						1 blank-quarry blade of orthoquartzite	
3	Rotted stump stain						1 sherd of indeterminate ware	
4	Burial Pit	.80m	.70m	Bone 1.87-1.98	Sloping sides, rounded base	Dark gray-tan sand	Calcined human bone	Pit originated just below humus at 1.67 m.b.d. Features 4-6 are likely associated/ contemporaneous with Feature 7.
5	Burial Pit	.40m	.50m	Bone 1.88-1.98	Sloping sides, rounded base	Dark gray-tan sand	Calcined human bone, 1 unknown biface of orthoquartzite, 1 sherd of indeterminate ware, 1 Wilmington sherd	"
6	Burial Pit	.40m	.50m	Bone 1.88-2.05	Sloping sides, rounded base	Dark gray-tan sand	Calcined human bone, 1 sherd of Thom's creek ware	"
7	Structure	10.5m SE-NW	6.0m SW-NE	Floor var. 1.80-1.85	Shallow lenticular	Dark gray-tan brown soil-moist, compact, greasy' (leached midden)	2 unifacial cores (orthoquartzite), 18 flake tools of orthoquartzite and Coastal Plain chert (14 utilized flakes, 1 perforator, 1 unknown, 1 burin, 1 spokeshave), 93 bifaces largely of orthoquartzite (26 unknown bifaces, 15 preforms, 13 Caraway, 13 unfinished bifaces, 5 unknown stemmed bifaces, 4 Uwharrie, 4 blank-quarry blades, 4 unknown bifacial tools, 3 unknown triangular bifaces, 3 "Santee-stemmed," 1 unknown corner-notched, 1 perforator-drill, 1 Guilford, 82 fully analyzed sherds of various wares (55 indeterminate, 1 Deptford, 1 Wilmington, 1 Cape Fear, 17 indeterminate Mississippian, 1 Irene, 3 Stalling's Island, 3 indeterminate Woodland), 6 baked clay fragments, 1 clay fragment, 1 clay pipe bowl, 1 clay pipe stem fragment, 2 steatite sherds, 1 possible daub frag.	Probable Mississippian house structure with associated subfeatures 1, 9, 7A-7EEE.

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
7A	Circular stain probable post-mold	.20m	.20m	1.82-1.91	Sloping sides, rounded base	Dark gray-brown sand becoming yellow-tan below floor		
7B	Circular stain probable post-mold	.40m	.40m	1.83-1.87	Sloping sides, rounded base	Dark and gray brown sand becoming yellow-tan below floor		
7C	"	.30m	.30m	1.795-1.825	"	"	1 unknown biface of orthoquartzite, 1 sherd of indeterminate Mississippian ware (rectilinear complicated stamped)	
7D	"	.20m	.30m	1.84-1.90	"	"		
7E	"	.35m	.40m	1.77-1.82	"	"		
7F	"	.25m	.40m	1.79-1.855	Basin-shaped Depression	Dark mottled gray-tan sand	2 sherds of indeterminate ware (1 indeterminate surface treatment, 1 plain)	
7G	Circular stain	.45m	.60m	1.775-1.855	"	"	1 unknown biface of orthoquartzite	
7H	Circular stain probable post-mold	.25m	.25m	1.775-1.87	Sloping sides, rounded base	"		
7I	Circular stain	.80m	1.15m	1.80-1.88	Basin-shaped Depression	Dark gray-brown sand		
7J	Circular stain probable post-mold	.10m	.10m	1.81-1.87	Sloping sides, pointed base	Dark gray-brown sand		
7K	Amorphous stain	.60m	.80m	1.82-1.84	Shallow Lenticular	Light tan-gray sand		
7L	Circular stain probable post-mold	.15m	.10m	1.82-1.895	Sloping sides, pointed base	Mottled, medium gray-tan sand		
7M	"	.35m	.30m	1.815-1.875	Sloping sides, rounded base	Mottled gray-brown sand		
7N	"	.25m	.25m	1.83-1.96	Straight sides, flat base	Dark gray-tan sand		
7O	"	.25m	.25m	1.78-1.82	Sloping sides, rounded base	Dark gray-tan sand		
7P	Large semi-circular stain	1.00m	1.50m	1.78-1.83	Slopes down toward Feature 1 Hearth	Dark gray-tan sand	1 sherd of indeterminate Mississippian ware (curvilinear complicated stamped), 1 sherd of indeterminate Woodland ware (plain)	Pit fill associated with Feature 1 - Hearth.
7Q	"	.70m	1.30m	1.77-1.87	"	"	1 unknown biface of orthoquartzite	"

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
7R	Circular stain probable post mold	.30m	.30m	1.89-1.94	Sloping sides rounded base	Dark gray-tan sand		
7S	Large, semi-circular stain	1.0m	1.90m	1.89-2.05	Slopes down toward Feature 1-Hearth	Dark gray-tan sand		Pit fill associated with Feature 1-Hearth.
7T	Irregular stain	.15m	.30m	1.81-1.86	Shallow lenticular	Light tan-gray sand		
7U	Circular stain, probable post mold	.30m	.30m	1.90-2.06	Sloping sides, rounded base	Dark gray-tan sand		
7V						Dark gray-tan sand		
7W	Circular stain, probable post mold	.25m	.25m	1.83-1.96	Sloping sides, rounded base	"		
7X	"	.20m	.15m+	1.83-1.89	"	"		
7Y	Large semi-circular stain	1.0m	1.60m	1.81-2.00	Slopes down toward Feature 1-Hearth	Dark gray-brown sand	2 sherds of indeterminate Mississippian ware (rectilinear complicated stamped)	Pit fill associated with Feature 1 - Hearth.
7Z	Circular stain, probable post mold	.20m	.20m	1.85-1.95	Sloping sides, rounded base	Dark gray-tan sand		
7AA	Circular stain, probable post mold	.20m	.25m	1.83-1.96	Nearly vertical sides, flat base	Dark gray-tan sand	1 Taylor biface of Coastal Plain chert	
7BB	"	.15m	.20m	1.84-1.90	Sloping sides, rounded base	Dark gray-tan sand		
7CC, cc'	Circular stain	.55m	.35m	1.86-1.88	Shallow basin shaped	"		cc' probable post mold in center of CC. Circular: sloping sides: rounded base: 1.88-1.98: .20m x .15m.
7DD, dd'	Overlapping circular stains, probable post-molds	.20m	.15m	1.84-1.93	Sloping sides, rounded bases	"		
7EE	Circular stain, probable post mold	.20m	.30m	1.85-1.94	Sloping sides, rounded base	"		
7FF	"	.20m	.20m	1.83-1.895	Nearly vertical sides, flat base	"		
7GG	"	.20m	.30m	1.82-1.89	"	"		
7HH	"	.15m+	.30m	1.81-1.885	"	"		
7JJ	"	.10m	.15m	1.81-1.86	"	"		
7KK	"	.20m	.20m	1.80-1.90	Sloping sides, slightly rounded base	"		
7LL	"	.20m	.20m	1.79-1.875	"	"		
7MM	"	.20m	.20m	1.825-1.975	"	"		
7NN	"	.30m	.20m	1.825-1.985	"	"	1 sherd of indeterminate ware (plain)	
7OO	"	.15m	.15m	1.85-1.90	Vertical sides, flat base	"		

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
7PP	Circular stain, probable post mold	.15m	.15m	1.86-1.92	Vertical sides, flat base	Dark gray-tan sand		
7QQ	"	.20m	.25m	1.845-1.925	Sloping sides, rounded base	Dark gray-tan sand		
7RR	"	.15m	.15m	1.85-1.93	"	"		
7SS	"	.20m	.25m	1.835-1.93	"	"		
7TT	"	.25m	.25m	1.83-1.90	Vertical sides, flat base	"		
7UU	"	.30m	.35m	1.84-1.88		"		
7VV	"	.20m	.20m	1.83-1.88	Sloping sides, rounded base	"		
7WW	"	.35m	.25m	1.84-1.89	Sloping sides, rounded base	"		
7XX	"	.40m	.30m	1.83-1.88	Vertical sides, flat base	"		
7YY	"	.20m	.20m	1.83-1.90	Sloping sides, rounded base	"		
7ZZ	"	.35m	.45m	1.80-1.85	Shallow basin shaped	"	1 sherd of indeterminate ware (plain)	
7AAA	"	.25m	.20m	1.85-1.94	Sloping sides, slightly rounded base	"		
7BBB	"	.20m	.20m	1.85-1.90	Sloping sides, slightly rounded base	"		Probably represents root disturbance.
7CCC	"	.25m	.25m	1.86-2.05	Vertical sides, rounded base	"		Probably represents a burned root.
7DDD	Circular stain	.45m	.40m	1.85-1.88	Shallow basin shaped	"		Probably represents root disturbance.
7EEE	Circular stain probable post mold	.20m	.20m	1.80-1.875	Sloping sides, rounded base	"		
8	Root stain							
9	Circular stain probable post mold	.20m	.20m	1.80-1.89	Sloping sides, flat base			Post mold associated with Feature 7-wall.
10	Circular burial pit	.25	.45m	1.85-2.05	Sloping sides, flat base	Dark gray-tan sand	Calcined human bone	Unlike Features 4-6 there was no dense bone concentration at base of pit.
11	Irregular, roughly circular sherd concentration	.80m	.80m	1.96-2.06	Sloping sides, slightly rounded base	Medium tan-brn sand	1 unknown biface of orthoquartzite	Portions of same Feature (11 &12) countered at different depths - merge toward base.
12	Irregular, roughly circular sherd concentration	.30m	.40m	1.91-2.13	Sloping sides slightly rounded base	Medium tan-brown sand	1 unfinished core of orthoquartzite, 3 bifaces of orthoquartzite and felsic tuff (2 Morrow Mountain II bifaces, 1 non-hafted cutting tool), 88 sherds of various wares (74 indeterminate, 7 Deptford, 5 Refuge, 2 indeterminate Mississippian), 21 clay fragments	Portions of same Feature (11 & 12) countered at different depths - merge toward base.

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
13	Complicated stamped vessel	.245m	.245m	2.25-2.45	Conoidal vessel in upright position	Medium-yellow tan Sand		No associated stain or artifacts
14AA	Circular Structure	3.0m	5.0m	Floor Var. 2.80-2.97	Shallow lenticular	Med. tan to slightly mottled tan-gray sand-leached midden	Calcined human and animal bone, 16 flake tools largely of orthoquartzite (13 utilized flakes, 1 side scraper, 1 unknown 1 other scraper), 10 bifaces largely of orthoquartzite (3 unknown bifaces, 3 unfinished bifaces 1 blank-quarry blade, 1 hafted cutting tool, 1 Taylor, 1 non-hafted cutting tool), 34 fully analyzed sherds of various wares (24 indeterminate, 1 Wilmington, 4 Cape Fear, 2 indeterminate Mississippian, 3 indeterminate Woodland)	
A	Circular stain, probable Postmold	.14m	.14m	2.80-2.92	Vert. sides, rounded base	Medium-gray-tan sand	3 sherds of indeterminate ware (1 indeterminate suface treatment, 2 plain)	
B	"	.21m	.21m	2.81-2.97	"	"		
C	"	.10m	.16m	2.80-2.86	Sloping sides, rounded base	"		
D	"	.08m	.16m	2.81-2.88	"	"		
E	"	.12m	.16m	2.82-3.01	Vert. sides	"	8 sherds of various wares (4 indeterminate - 3 plain and 1 punctate; 2 Cape Fear - cord marked; 2 indeterminate Mississippian - 1 curvilinear and 1 rectilinear complicated stamped)	No bottom - possible root
F	"	.07m	.15m	2.82-2.87	Sloping sides, rounded base	"	Lithic debitage (flakes of bifacial retouch, chunks and tertiary flakes of orthoquartzite, coastal plain chert, other chert and flow-banded ryolite)	
G	"	.13m	.13m	2.83-2.90	"	"		
H	Root stain ----	Deleted---------						
I	Circular stain, probable postmold	.14m	.16m	2.83-2.90	Sloping sides, rounded base	"	1 sherd of indeterminate ware (plain)	
J	"	.15m	.10m	2.84-2.93	Vert. sides, flat base	"	1 sherd of indeterminate ware (punctate)	
K	"	.18m	.18m	2.82-2.87	"	"		
L	"	.23m	.19m	2.83-2.95	Sloping sides, rounded base	"		
M	"	.12m	.12m	2.83-2.91	"	"		

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
N	Circular Stain probable post-mold	.12m	.12m	2.83-2.91	Sloping sides, rounded base	Medium-gray tan sand		
O	"	.11m	.11m	2.85-2.93	"	"		
P	Root stain----- Delete--							
Q	Circular stain probable post-mold	.16m	.20m	2.83-2.92	Sloping sides, rounded base	Medium-gray tan sand	1 sherd of indeterminate ware (indeterminate surface treatment)	
R	"	.15m	.15m	2.83-2.95	Vert. sides, rounded base	"	2 sherds of cape fear ware (fabric impressed)	
S	"	.14m	.17m	2.81-2.92	Sloping sides, rounded base	"		
T	"	.16m	.09m	2.81-2.88	"	"		
U	Circular bone concentration	.35m	.23m	2.92-2.94	Sloping sides, rounded base	Medium-dark-gray sand	Calcined bone, orthoquartzite debitage (flakes of bifacial retouch), 1 sherd of indeterminate ware (plain)	
A'	Circular stain	.26m	.26m	2.94-3.22+	Sloping sides, rounded base	Dark gray sand		
B'	Circular bone concentration	.20m	.16m	2.90-3.08	Sloping sides, rounded base	Red-brn. sandy clay	Calcined bone	
C'	"	.30m	.47m	2.85-3.19	"	Medium yellow-tan sand	Calcined bone	
D'	Circular stain, probable storage/refuse pit	1.35m	1.55m	2.91-3.36	Basin-shaped	Dark, mottled gray sand	2 flakes (1 unknown 1 caraway), lithic debitage (flakes of bifacial retouch, chunks and tertiary flakes of orthoquartzite, Coastal Plain Chert, ridge and valley chert, other chert, flow-banded ryolite and felsic tuff)	Dense sherd concentration at top; little bottom. Pre-dates postmolds 14E-F and probably structure.
148B	Large, circular burial pit	4.0m	5.0m	Pit var. 2.82-3.45	Generally inward sloping sides with slightly rounded base	Dark brn., fine med. sand-leached midden	Predominantly calcined human bone with some animal bone and lithic and ceramic artifacts. Artifacts include: 3 flake tools of orthoquartzite (2 utilized flakes, 1 side scraper), 18 bifaces largely of orthoquartzite (4 unknown bifaces, 4 unknown stemmed bifaces, 3 hafted cutting tools, 2 preforms 2 blank-quarry blades, 1 atlatl weight fragment of granite? 1 catlinite or hematite tubular bead, 17 sherds of various wares (3 indeterminate Woodland, 3 indeterminate Mississippian, 11 indeterminate plain wares), 43 baked/burned clay fragments, 1 clay ball, 6 steatite sherd fragments	Large burial pit representing discrete dumping/burial episodes with spare artifacts intentionally or incidentally included.

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
V	Bone concentration	.30m	.25m	2.91-3.13	Expands toward flat base	Medium tan-brown sand	Calcined bone, 1 orthoquartzite flake (chunk), 2 bifaces (1 unknown and 1 hafted cutting tool - orthoquartzite and Coastal Plain chert)	
W	"	.40m	.40m	3.92-3.25	"	"	Calcined bone, lithic debitage (flakes of bifacial retouch, chunks, secondary flakes and tertiary flakes of orthoquartzite, Coastal Plain chert, other chert, flow-banded ryolite and porphyoritic ryolite), quartz hammerstone	
X	"	.64m	.42m	2.92-3.10	"	"	Calcined bone	
Y	"	.20m	.30m	2.94-3.02	"	"	Calcined bone	
E'	"	.42m	.21m	2.92-3.01	"	Medium yellow-tan coarse sand	Calcined bone, 1 orthoquartzite chunk	
F'	"	.58m	.20m	2.90-3.20	Slopes down to the s.w.	Brown-red med. coarse sand	Calcined bone	
G'	"	.19m	.16m	3.09-3.16	Expands toward flat Base	Yellow -tan, med. coarse sand	Calcined bone	Terminates on yellow-tan, med.-coarse sand at base of feature 14BB
H'	"	.30m	.50m	3.03-3.31	"	Predom. med. tan-brown sand	Calcined bone, orthoquartzite debitage (flakes of bifacial retouch and chunks), 24 clay fragments	"Red ochre" stained bone at west (top) end. Slopes down to the east and north under 14BB-HH. Terminates at base of 14BB
I'	"	.25m	.38m	3.21-3.32	"	Dark tan-brn. sand	Calcined bone	Terminates on yellow-tan sand at base of 14BB
J'	"	.38m	.28m	3.10-3.20	"	"	Calcined bone	"
K'	"	.42m	.36m	3.20-3.36	"	"Red ochre" stained sand (Hematite)	Calcined bone, lithic debitage of orthoquartzite and flow-banded ryolite (flakes of bifacial retouch), 3 orthoquartzite bifaces (1 Savannah River, 1 unknown stemmed, 1 preform), 1 atlatl weight fragment of steatite	Little material in fea. but a relatively dense concentration of lithics in the adjacent 1x1m units. No charcoal. Terminates on yellow-tan sand at base of 14BB. K' slopes under KK.
L'	"	.55m	.36m	3.12-3.20	"	Dark tan-brn sand	Calcined bone	Terminates at base of 14BB
M'	"	.21m	.19m	3.03-3.08	Slopes down to Southeast	"	Calcined bone	"
N'	"	.20m	.21m	3.06-3.13	"	"	"	"
O'	"	.35m	.38m	3.02-3.13	Horizontal lens	"	Calcined bone, lithic debitage of orthoquartzite and Coastal Plain chert (flakes of bifacial retouch), 1 utilized flake of orthoquartzite	"

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
P'	Bone concentration	.25m	.25m	2.94-3.04	Horizontal lens	Dark tan-brown sand	Calcined bone, lithic debitage of orthoquartzite (flakes of bifacial retouch and chunks)	Terminates at base of 14BB
Q'	"	.22m	.20m	2.93-2.98	"	"	Calcined bone; lithic debitage of orthoquartzite, Coastal Plain chert, flow-banded ryolite and other tuff (flakes of bifacial retouch, tertiary flakes, chunks); 2 clay fragments	Terminates above QQ.
R'	"	.27m	.22m	3.07-3.18	"	"	Calcined bone	Terminates at base of 14BB.
S'	"	.21m	.21m	3.17-3.23	"	"	Calcined bone	"
T'	"	.47m	.43m	2.93-3.26	Slopes down to north	"	Calcined bone, lithic debitage of orthoquartzite (flakes of bifacial retouch)	"
U'	"	.25m	.26m	3.06-3.15	Horizontal lens	Dark tan-brown sand	Calcined bone	Terminates at base of 14BB.
V'	"	.57m	.32m	2.96-3.05	"	"	Calcined bone	Terminates at base of 14BB. Bone stained with yellow ochre (Limonite)
W'	"	.38m	.25m	2.91-3.25	Expands toward flat base	Med. tan-brn sand	Calcined bone, lithic debitage of orthoquartzite and other chert (flakes of bifacial retouch, tertiary flakes chunks), 6 clay fragments	
X'	Bone and lithic concentration	.30m	.30m	3.27-3.45	"	"Red ochre" stained sand (hematite)	Calcined bone, lithic debitage of orthoquartzite (flakes of bifacial retouch) 1 utilized flake of orthoquartzite, 2 bifaces (1 unknown stemmed and 1 hafted cutting tool of orthoquartzite and other ryolite)	
Y'	Bone concentration	.52m	.51m	2.92-3.23	"	Dark brown sand	Calcined bone, lithic debitage of orthoquartzite (flakes of bifacial retouch, chunks), 1 Kirk corner-notched biface (other ryolite)	Terminate at base of 14BB
Hd	"	.22m	.50m	3.05-3.16	Slopes down to east.	Dark tan-brn. sand	Calcined bone, orthoquartzite (flakes of bifacial retouch, tertiary flakes, chunks), 1 non-hafted cutting tool of flow-banded ryolite.	
KK	"	.16m	.21m	3.11-3.15	Horizontal lense	Dark tan-brn. sand	Calcined bone	Terminates above K'
PP	"	.63m	.45m	3.13-3.36	Expands toward flat base	"Yellow ochre" (Limonite) stained sand and bone	Calcined bone	Terminates at base of 14BB
QQ	"	.24m	.20m	3.06-3.36	Slopes down to south below Q'	Dark brown sand	Calcined bone	"

Table 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
15	Possible circular structure	5.5m	4.25m	Floor Var. 1.82-1.92	Shallow lenticular	Dark yellow-tan (Leached Midden?) sand with gray mottling and sporadic areas of clay (red-brown) substrate	1 blank-quarry blade of orthoquartzite, 3 orthoquartzite chunks, 1 undeterminate sherd 1 broken quartz cobble	Defined by "leached midden stain" and subfeatures (postmolds) 15A-V
A	Circular stain, prob. postmold	.10m	.10m	1.95-2.09	Vert. sides rounded base	Mottled Med. gray-tan sand		
B	"	.10m	.10m	1.94-2.00	Sloping sides, rounded base	"		
C	"	.06m	.08m	1.73-2.02	Vert. sides, rounded base	"		
D	"	.12m	.12m	1.93-2.06	"	"		
E	Root stain------Deleted------							
F	Circular stain, prob. postmold	.12m	.12m	1.94-2.05	Vert sides, rounded base	Mottled med., gray-tan sand		
G	"	.06m	.06m	1.97-2.19	Vert. sides, no bottom	"		Possible root stain
H	"	.09m	.20m	1.88-1.94	Sloping sides, rounded base	"		
I	"	.05m	.05m	1.86-1.95	Vert. sides, rounded base	"		
J	"	.10m	.10m	1.86-1.95	Sloping sides, rounded base	"		
K	"	.10m	.07m	1.84-1.88	"	"		
L	"	.10m	.10m	1.85-1.94	Vert. sides, rounded base	"		
M	"	.10m	.10m	1.85-1.93	Sloping sides, rounded base	"		
N	"	.10m	.13m	1.86-1.93	"	"		
O	"	.16m	.15m	1.84-1.93	"	"		
P	Circular stain, prob. postmold	.12m	.12m	1.84-1.93	Sloping sides, rounded base	Mottled med. gray-tan sand		
Q	"	.11m	.11m	1.85-1.93	"	"		
R	"	.10m	.06m	1.82-1.90	"	"		
S	"	.07m	.07m	1.85-1.93	"	"		
T	"	.10m	.10m	1.88-1.98	Vert. sides, rounded base	"		
U	"	.10m	.12m	1.90-1.99	Sloping sides, rounded base	"		
V	"	.09m	.10m	1.91-2.01	Vert. sides, rounded base	"		
16	Possible circular structure	3.75m	5.75m	Floor var. 1.68-1.78	Shallow lenticular	Dark yellow-tan gray (Leached midden?) med.-fine sand with red clay substrate in S.E. portion	1 Caraway biface of orthoquartzite, debitage of orthoquartzite (1 chunk, 2 flakes of bifacial retouch), 1 sherd (not analyzed)	
A	Circular stain prob. postmold	.10m	.10m	1.70-1.73	Sloping sides, rounded base	Med., gray-tan sand		

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section)	Fill	Contents	Comments
B	Circular stain prob. postmold	.16m	.20m	1.71 -1.80	Sloping sides, rounded base	Med.-gray-tan sand	1 sherd of indeterminate Mississippian ware (rectilinear complicated stamped)	
C	"	.11m	.11m	1.73-1.77	"	"		
D	"	.14m	.20m	1.74-1.83	"	"		
E	"	.20m	.27m	1.75-1.82	"	"	1 flake of bifacial retouch (ortho-quartzite)	
F	"	.13m	.15m	1.76-1.80	Sloping sides, rounded base	"		
G	"	.22m	.16m	1.78-1.85	"	"		
H	"	.15m	.15m	1.79-1.92	"	"	1 plain sherd	
I	"	.09m	.09m	1.79-1.89	Vert. sides, rounded base	"		
J	"	.09m	.09m	..80-1.85	Sloping sides, rounded base	"		
K	"	.10m	.12m	1.79-1.85	"	"		
L	"	.13m	.16m	1.79-1.85	Vert. sides, flat base	"		
M	"	.10m	.12m	1.77-1.81	Sloping sides, rounded base	"		
N	"	.10m	.13m	1.77-1.81	"	"		
O	"	.09m	.12m	1.75-1.85	Vert. sides, rounded base	"		
P	"	.09m	.13m	1.75-1.80	Sloping sides, rounded base	"		
Q	"	.12m	.12m	1.73-1.78	"	"	1 sherd of undeterminate ware	
R	"	.08m	.10m	1.74-1.79	"	"		
S	"	.08m	.08m	1.76-1.81	"	"		
T	"	.09m	.13m	1.74-1.78	"	"		
U	"	.11m	.16m	1.70-1.74	"	"		
V	"	.11m	.14m	1.69-1.76	Vert. sides, rounded base	"		
W	"	.11m	.15m	1.69-1.76	Sloping sides, rounded base	"		
X	"	.18m	.14m	1.68-1.76	"	"	1 sherd of indeterminate ware (indeterminate surface treatment)	
Y	"	.12m	.12m	1.69-1.74	"	"		
Z	"	.12m	.10m	1.69-1.75	"	"		
A'	"	.12m	.12m	1.71-1.76	"	"		
B'	"	.08m	.08m	1.71-1.75	"	"		
C	"	.20m	.20m	1.70-1.95	"	"		Possible root stain

TABLE 1 (Cont.)

Feature Designation	Type Feature	Maximum North-South Dimensions	Maximum East-West Dimensions	Depth Meters Below Datum	Vertical Morphology (Cross-Section	Fill	Contents	Comments
17	Possible circular structure	5.0m	3.20m	Floor Var. 2.40-2.50	Shallow lenticular	Med. textured dark yellow-tan-gray sand (leached midden?) with sparse patches of red clay substrate	2 orthoquartzite flakes of bifacial retouch	Defined by leached midden stain and subfeatures (postmolds) 17A-R.
A	Circular stain, prob. postmold	.09m	.13m	2.42-2.47	Sloping sides, flat base	Medium gray tan sand	1 orthoquartzite flake of bifacial retouch	
B	"	.13m	.20m	2.43-2.58	Vert. sides, rounded base	"	1 orthoquartzite flake of bifacial retouch	
C	"	.10m	.10m	2.41-2.45	Sloping sides, rounded base	"		
D	"	.08m	.12m	2.42-2.44	"	"		
E	"	.10m	.08m	2.44-2.46	"	"		
F	"	.19m	.11m	2.45-2.46	"	"		Possible root stain.
G	"	.12m	.10m	2.46-2.57	Vert. sides, rounded base	"	1 plain sherd	
H	"	.08m	.08m	2.45-2.53m	Sloping sides, rounded base	"		
I	"	.18m	.18m	2.47-2.53	"	"		
J	"	.08m	.08m	2.46-2.48	"	"		
K	"	.07m	.10m	2.48-2.55	"	"		
L	"	.14m	.14m	2.48-2.55	"	"		
M	"	.16m	.16m	2.48-2.52	"	"		
N	"	.15m	.10m	2.48-2.52	"	"		
O		.15m	.15m	2.47-2.53	"	"		
P	"	.10m	.13m	2.45-2.50	"	"		
Q	"	.10m	.11m	2.45-2.49	"	"	1 orthoquartzite flake of bifacial retouch	
R	"	.10m	.14m	2.46-2.51	"	"		
18	Quartz Cobble Cache	.60m	.40m	Variable 2.29-2.35	Shallow lenticular	Same as surrounding soil matrix-yellow tan sand	Cluster of 4 river-worn quartz cobbles (15x10 x8cm, 11x6x3cm, 8x6x3cm, 8x5x8cm—1probable mono and 1 probable metate/ grinding stone)	Isolated Feature

Block Excavation Area 3

A relatively high density of orthoquartzite, early-stage reduction flakes and a large orthoquartzite core were discovered in unit 190-191S, 371-372E during the intensive testing phase. Again, a major lithic reduction activity area was suggested. In order to obtain yet another glimpse at the intrasite patterning of 38BK235, an irregularly shaped block within the general coordinates of 190-194S, 366-371E was excavated (Figs. 6, 13).

Including the original 1 x 1 meter excavation unit, Block Excavation Area 3 consisted of a total of 25 contiguous 1 x 1 meter excavation units. Each unit was excavated to a depth of 25-35 cm by shovel skimming and screening the soil within 10 cm levels. Soil samples were taken from a few arbitrarily selected squares and levels. The preservation of floral and faunal remains in these nonorganic, sandy, acidic soils would be generally poor. Consequently, no additional soil samples were taken from the block excavation area.

The block area was characterized by natural, though somewhat irregular (viewed from the horizontal), stratification. The top ca. 10 cm consisted of a dark gray-brown, medium-textured, sandy humus, underlain by a transitional (Soil Horizon A) medium gray-brown, medium-textured sand that extended to a variable depth of about 20 cm. Gradually, the soil became a light tan, medium-to-coarse-textured sand, that terminated on top of a highly irregular, orange-brown, sandy-clay substrate at 25 to 30 cm below the ground's surface.

Figure 13: Site 38BK235: Block Excavation Area 3 at 25-35 cm, view looking south.

The frequency of archeological materials within the block area was quite variable, though generally low. No obvious features were observed. Artifacts were present at all depths, but tended to concentrate between 10-20 cm below the ground-surface. There is no apparent vertical separation or superposition of archeological materials with different temporal periods. In fact, most if not all materials are probably Mississippian. The relatively high frequency of Mississippian period complicated stamped ceramics was unexpected, especially in view of the high frequency of lithic debitage and lack of ceramics in the adjacent testing phase unit. As subsequently discovered during grading, the artifacts in this area are probably associated with nearby Feature 14.

Bulldozing and Grading

Following the excavation of the three block areas at 38BK235, the area was carefully bulldozed and graded from the terrace edge south of the approximate site limit defined by the testing. This was for the express purpose of discovering additional Mississippian structures and features, if they existed. Assuming that such remains would be about the same depth below ground surface as Feature 7 (referred to as the "Main House"), it was essential that the bulldozing and subsequent initial grading not remove or significantly disturb more than the top 20 cm.

Once the overburden was removed to a depth of about 20 cm, the area was systematically graded through a series of 1-2 cm cuts to a maximum depth of about 30 cm. Field crew members followed the grader, looking for "suspicious" dark stains in the medium yellow-tan sand matrix or noticeable artifact concentrations. These stains and/or concentrations were flagged and subsequently examined by means of shovel skimming after each cut of the entire area. Upon examination, most stains were found to be the result of root activity. After grading, a 20 x 20 meter grid (tied into the site grid system) was established over the area for controlled surface collections, facilitating the mapping of the newly discovered features. Vertical control for mapping and feature removal was maintained through the transit station located adjacent to Block Excavation Area 1 at 164S, 305E.

Controlled surface collections were conducted after a series of hard summer rains. A wide variety of artifacts and lithic debitage was recovered. Although materials that could be reasonably attributed to the Mississippian occupation were probably most highly represented, earlier materials of the Archaic and Woodland periods were also present. Archeological materials were present in all portions of the graded area. However, the highest concentration of material, especially Mississippian, was between Block Excavation Areas 1 and 3, along the terrace-swamp edge (Fig. 8). No specific artifact concentrations were observed outside of Features 13-18.

Feature 13 was a nearly complete Mississippian complicated stamped, conoidal vessel encountered by the grader at about 30 cm below ground surface. This seemingly isolated feature was found in an up-right position within a medium, yellow-tan sand matrix characteristic of this depth. There were no soil stains or other artifacts associated with the vessel (Figs. 6, 14; Table 1).

Figure 14. A nearly complete Mississippian complicated stamped, conoidal vessel encountered by the grader at about 30 cm below ground surface.

The soil was excavated from around the vessel, leaving it pedestalled in situ. The pedestal, vessel, and remaining soil matrix were then removed and brought back to the lab. Once in the lab, the remaining soil from around the vessel was removed and the entire soil content floated. No floral or faunal remains were recovered. However, upon removing the vessel fill, it was discovered that an irregular, roughly circular, post-firing "kill-hole" was present in the base. Interestingly, the interior portion of the kill-hole was covered by a large, thick, undecorated basal sherd from another vessel (Chapter 4).

Feature 14 was first observed at about 20 cm below ground surface as a dark brown, fine-to-medium textured sand (leached midden) with small concentrations of white to blue-gray, calcined bone fragments. The surrounding, natural soil matrix was a medium yellow-tan sand. The surface of the feature was carefully shovel skimmed and trowelled, leaving all exposed bone and artifacts in situ, in order to define better its nature and extent. During this process, it was observed that the feature had two associated (probably temporally as well as spatially) components, subsequently designated as Features 14AA and 14BB.

A grid system, tied into the site grid, consisting of contiguous 1 x 1 meter units, was established over the feature area in preparation for excavation (Block Excavation Area 4--Figs. 6, 15, 16). Vertical control during excavation was maintained via the transit station at 164S, 305E. Prior to excavation, the exposed portions of the features, and their respective subfeatures, were mapped. Artifacts that had been exposed were mapped and removed.

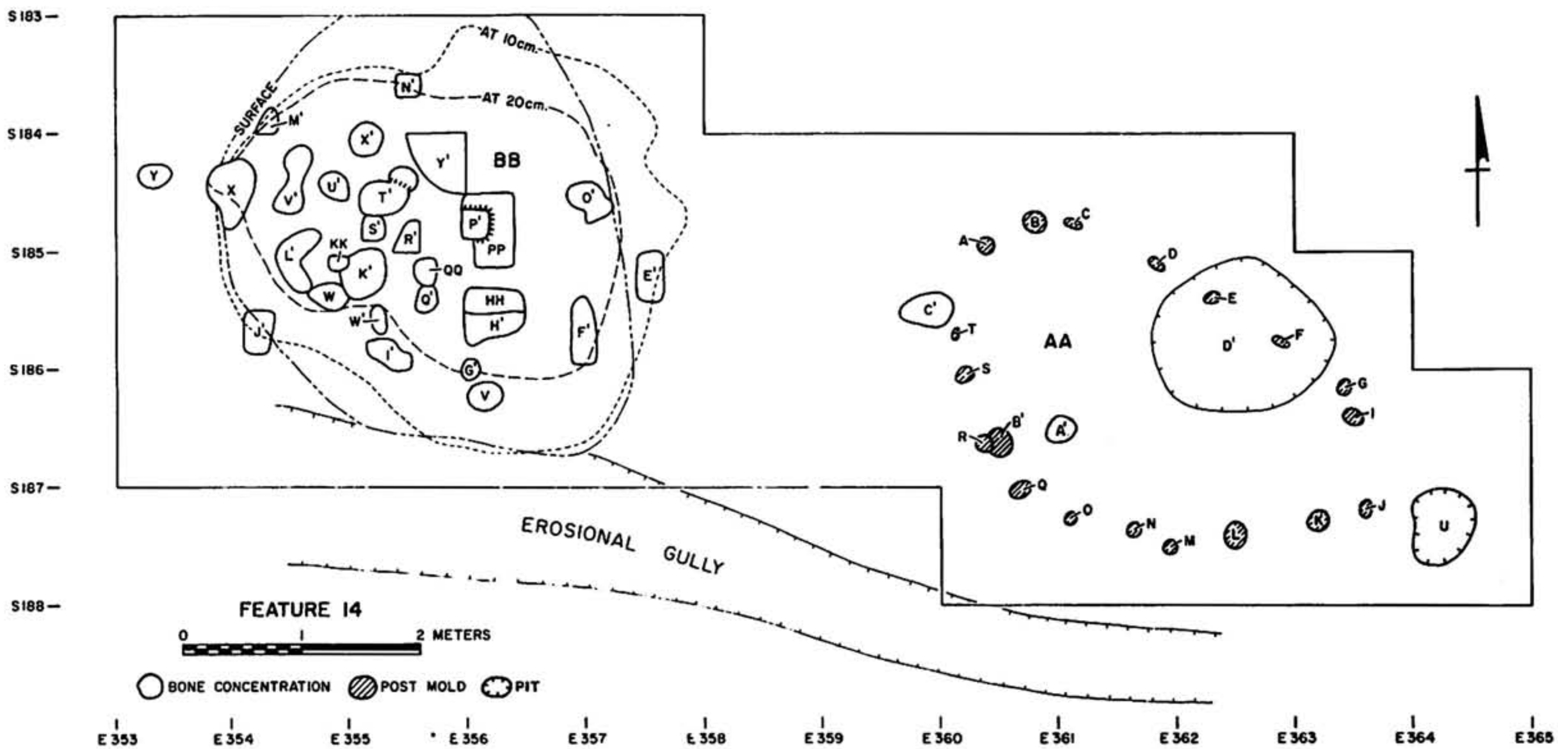


Figure 15. Site 38BK235: Block Excavation Area 4 showing locations of Features 14AA and 14BB.

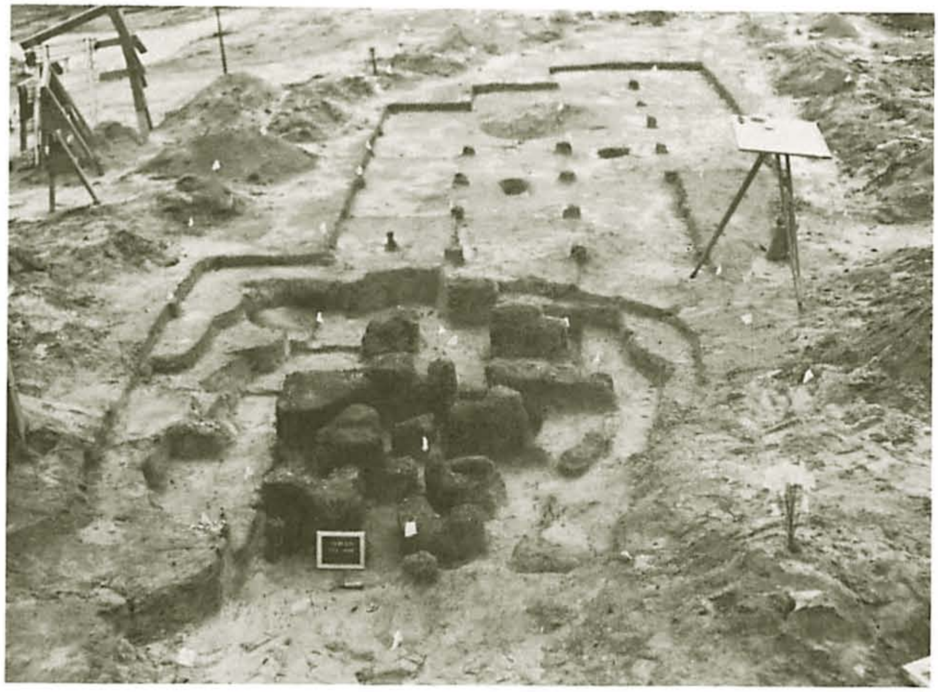


Figure 16. Site 38BK235: Block Excavation Area 4 after excavation, showing Feature 14BB subfeature pedestalled in foreground. View looking east.

The feature area was excavated by shovel skimming and trowelling within 10-cm arbitrary levels. Exposed artifacts were mapped and removed. Excavated materials were screened through one-eighth-inch mesh hardware cloth in order to maximize the recovery of bone and other potentially preserved subsistence data. Ideally, all fill material should have been floated; this, unfortunately, was impossible in the five days allotted for excavation of the entire feature area. Nevertheless, a heavy emphasis was placed on the systematic collection of special samples, primarily flotation samples, from Feature 14AA and 14BB.

Feature 14AA was a small (ca. 3 x 5 meter) oval-shaped structure defined by postmolds (Subfeatures A-T--medium gray-tan sand fill) and a medium brown to slightly mottled tan-gray sand occupation surface (Figs. 6, 15; Table 1). Archeological materials associated with Feature 14AA, in addition to bone concentrations (mostly human--Subfeatures U, B', C') consisted primarily of lithic and ceramic artifacts attributable to the Mississippian period. A probable storage/refuse pit (Subfeature D'--dark, mottled-gray sand fill) was of particular interest (Fig. 15). The bottom two-thirds of the pit contained virtually no artifacts, whereas the upper portion contained a high density of ceramics, particularly Mississippian complicated stamped wares. This may suggest that the pit was used for storage and subsequently filled with refuse. It is also interesting that postmolds E and F penetrated into the top of the D' fill, indicating that the structure postdates the storage/refuse pit.

The postmolds and storage/refuse pit were excavated, and the bone concentrations pedestalled. The entire fill from all subfeatures was saved for flotation and special analyses. Removal of the subfeatures was followed by the excavation of the occupation surface in one level, which varied from between 8 to 10 cm in thickness and terminated on top of a medium yellow-tan sand. Care was taken to separate the materials from inside and outside the feature within the 1 x 1 meter excavation units. Artifacts exposed during the course of excavation were mapped and removed. Soil samples were taken from each level of each unit, inside and outside the feature.

Bone from Subfeatures U, B', and C' was submitted, after osteological analysis, for C-14 dating (U Ga 3974). Because of the relatively small amount of bone, it was necessary to combine all three subfeatures for dating. Wood charcoal, while present in Feature 14AA in small amounts, was not submitted, because its proximity to the surface increased the likelihood of contamination due to root action and modern burning in the vicinity.

Feature 14BB was a large (ca. 4 x 5 meter), circular, basin-shaped pit that reached a maximum depth of about 50 cm toward the center. The pit fill was characterized by a dark brown, fine to medium textured, leached midden sand with bone and sparse number of artifacts throughout. Within the fill, however, there were a number of observable bone concentrations, Subfeatures V-Y, E'-Y', and HH-QQ (Fig. 15; Table 1).

In the absence of discernible stratification, excavation of the pit fill was accomplished by shovel skimming and trowelling within 10-cm levels in the 1 x 1 meter units to the base of the feature (medium yellow-tan sand). Soil samples were obtained for flotation and special analyses from each 10-cm level of each excavation unit.

Bone concentrations discovered in the process were pedestalled and the units taken down around them (Fig. 15). Under difficult field conditions, 29 were defined and removed as separate subunits. The entire contents of each bone concentration were also removed in 10-cm levels and saved for flotation and special analyses. After the osteological analysis, bone from Subfeatures T' (the top of 14BB) and PP (the base of 14BB) was submitted for C-14 dating (U Ga 3971). Neither the bone from Feature 14AA or 14BB was datable (D.F. Smith 1981).

The archeological material from Feature 14BB consisted primarily of calcined human bone. However, some mammal, turtle, and bird bone, as well as some botanical remains, were also present (Chapter 6). Bone concentrations H', K', and X', were particularly interesting in that the bone and associated soil matrix were heavily stained with red ochre/hematite. Similarly, bone concentrations V' and PP are stained with yellow ochre/limonite.

Although sparse, the artifacts from Feature 14BB were unusual in combination. A few diagnostic Mississippian artifacts occurred, primarily near the top of the feature. The remaining artifacts, however, seemed quite out of place for a Mississippian context. These artifacts included large, stemmed bifaces, steatite sherds, a catlinite or hematite tubular bead, and a few lithic flakes (Table 1). These artifacts are reminiscent of a Late Archaic assemblage (e.g., Stoltman 1974). The bifaces and flakes are particularly conspicuous because of their heavy use-edge damage, suggesting cutting and/or butchering related activities (Chapter 5). It may be significant that these artifacts tend to be associated with the red-ochre stained bone concentrations.

Feature 14BB is similar to Features 4, 5, 6, and 10, but differs in scale and is spatially separated from the Block Excavation Area 1 by about 50 meters. Because of the bone preservation, the high density of Mississippian materials in the block area, and the nearby position of Feature 7, these latter features are tentatively assigned to the Mississippian period. It is suggested that Feature 14BB is also Mississippian. The major evidence to the contrary is the traditionally typed, earlier bifaces found within the feature and subfeatures. Earlier cultural components, undoubtedly present at 38BK235, may have been disturbed in the excavation of the pit, aboriginally. This does not preclude the possibility that earlier artifacts, for whatever reason, may have been collected/curated by Mississippian populations and used in an entirely different context. Typologically early artifacts are quite common in at least some Mississippian period sites (e.g., Willey 1949). Whether tools from earlier assemblages were intentionally picked up and used or inadvertently included in the deposit remains uncertain.

There are several observations concerning the morphology of Feature 14BB and its contents that may, along with other lines of data (Chapters 4, 5, 6), be useful ultimately for interpreting Feature 14BB, as well as its relationship to Feature 14AA and other Mississippian features and activity areas at 38BK235. Figure 15 shows that 14BB slopes down into an old erosional gully or stream channel that was discovered during grading. Subsequently defined during the excavation of Features 14AA and 14BB, the gully is characterized by a coarse, light yellow-to-white quartz sand. The feature (pit) was actually excavated, prehistorically, into the bank of the gully, rather than down from the surface. This is strongly suggested by the undercut sides between the surface and 20 cm along the northern and eastern edges of the feature. The undercut sides, especially given the unconsolidated sand matrix, further suggest that the pit was not open for any length of time; otherwise, the sides would have slumped inward. The lack of "washed-in" material further supports the inference that pit 14BB was open only briefly.

Considerable information can be obtained from the location and orientation of the bone concentrations themselves. While the evidence suggests that the pit was open briefly, at least two series of sequential dumping episodes are indicated. Most of the bone concentrations--the initial deposits--terminate at the base of the feature. A few concentrations, however, were deposited later. These are on top of, and "spill-over," the earlier ones, though not in any consistent direction.

Thus, a number of discrete dumping episodes is indicated. The term "dumping" is used to describe the apparent depositional process. If the bone had been directly deposited or contained (wrapped), spill-over would not have occurred.

Based on field observations, especially the similarity in the nature and condition of the bone from Features 14AA and 14BB, as well as the spatial proximity and seeming continuity of the two features, it is tempting to speculate that most of the physical remains (primarily bone) of activities conducted in and around the Feature 14AA structure were subsequently deposited in the Feature 14BB. With regard to the activities leading up to the bone being deposited in the pit, in light of data suggesting that the pit was open only briefly and that a number of individuals are involved, the question of whether the bone was dry or green just prior to burning and deposition is an extremely critical one. If green, then mass death (massacre, sacrifice, epidemic, etc.) may be indicated. If dry, then a charnel house situation in which bodies were treated and stored for infrequent, mass burial might be suggested. Neusius (Data Supplement II) believes that the bone was burned when green.

Finally, the association of human bone, artifacts, and animal bone certainly suggests some intriguing behavioral possibilities. Although artifacts and bone occurred throughout the matrix, a significant percentage is differentially distributed within eight subfeatures (Table 2; Fig. 15). These materials represent 20% of the bifaces, and of the identifiable bone, 78% of the dog; 44% of the turtle; 81% of the turkey; and 67% of the deer. None of the artifacts appears burned. The red hematite bead had not turned black; the staining on the bifaces apparently resulted from the red ochre; and the red ochre and yellow limonite still retained their coloring. Interestingly, the deer, turkey, turtle, and dog bone (but not the raccoon) were burned. If the animal bones are grave inclusions, then receipt of the same treatment as human bone might suggest some sort of personal ornamental or clan indication. On the other hand, the animal and human bone may have been treated alike, i.e., processed and/or consumed in a ritualistic or secular context. One thing seems clear: the activities associated with Features 14AA and 14BB cannot be considered typical, based on what little is known about human burial practices or animal butchering-processing during the Mississippian period in the southeastern, interior Atlantic Coastal Plain.

Features 15, 16, and 17 were encountered at about 20 cm below ground surface and appear to be very similar to Feature 14AA. All three structures were defined by elliptical alignments of postmolds (Subfeatures 15 A-V, 16 A-C', and 17 A-R) and thin, faint, leached (?) middens 10 cm or less in thickness. These features, which measure between 10 and 15 square meters, cluster together (Figs. 17-20; Table 1). Gaps or openings appear in the postmold patterns on the western sides of the structures. The postmolds in Features 15 and 17, which resemble each other more than they do Feature 16, exhibit regular spacing, with some double postmolds that may indicate repairs. Feature 16 exhibits tighter spacing between the post and is also more D-shaped.

After their discovery, the features were shovel skimmed and trowelled in order to determine their nature and extent. Exposed artifacts and subfeatures were mapped using the 20 x 20 meter controlled-surface collection grid and transit station located at 164S, 350E. Once mapped, the artifacts were removed and the postmolds were excavated and/or cross-sectioned. All the postmold contents were saved and floated.

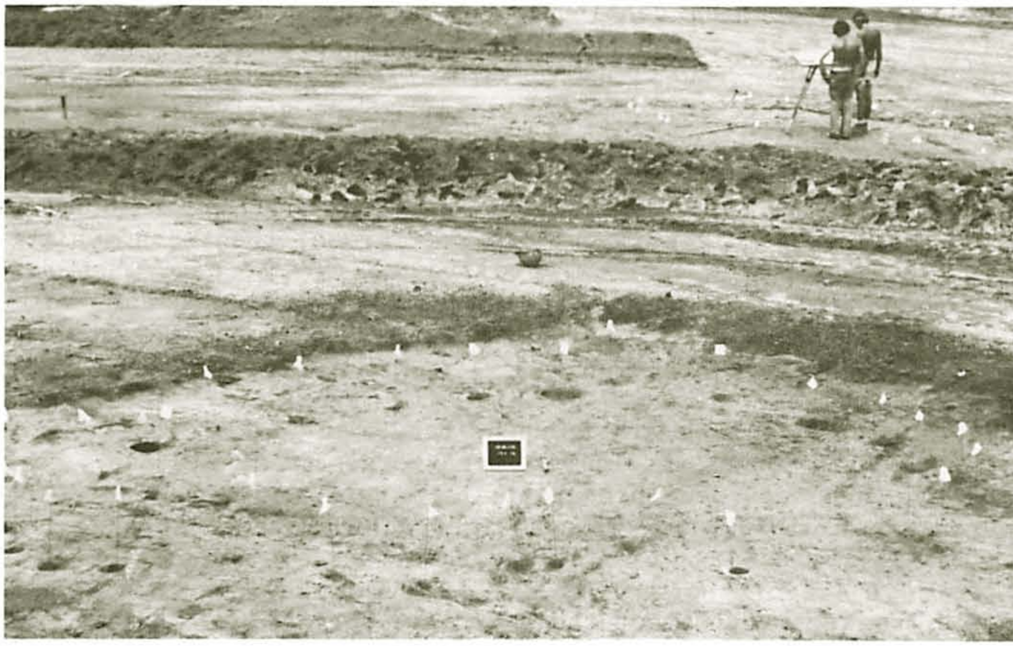


Figure 17: Site 38BK235: Phase II, grading showing Feature 16 in foreground and Feature 15 in background.

The occupation surfaces were characterized by medium-textured, dark yellow-brown sand with some gray mottling (root disturbance) and patches of red-brown sandy-clay substrate. The surrounding soil matrix consisted of medium yellow-tan sand. Excavation of the occupation surfaces inside the structures was continued until all the "dark stain" was removed. For comparative purposes, the area outside each structure was shovel skimmed to a depth equivalent to the base of the occupation surface inside. Exposed artifacts were mapped and collected, and soil samples were selectively obtained.

The ephemeral nature of these structures may be apparent or real. The relatively few artifacts (no higher density than the surrounding area), absence of subsurface features (other than postmolds), and the general similarity of all three structures suggested that the structures were, in fact, rather ephemeral.

Conversely, the occurrence of substrate with all three structures may indicate that the upper more intensively utilized portions of the occupation surfaces were inadvertently removed during the grading operation, with only the basal portions remaining. While this is certainly a possibility, one would still expect to have encountered the basal portions of pits, hearths, etc., had the structures actually been of more substantial nature.

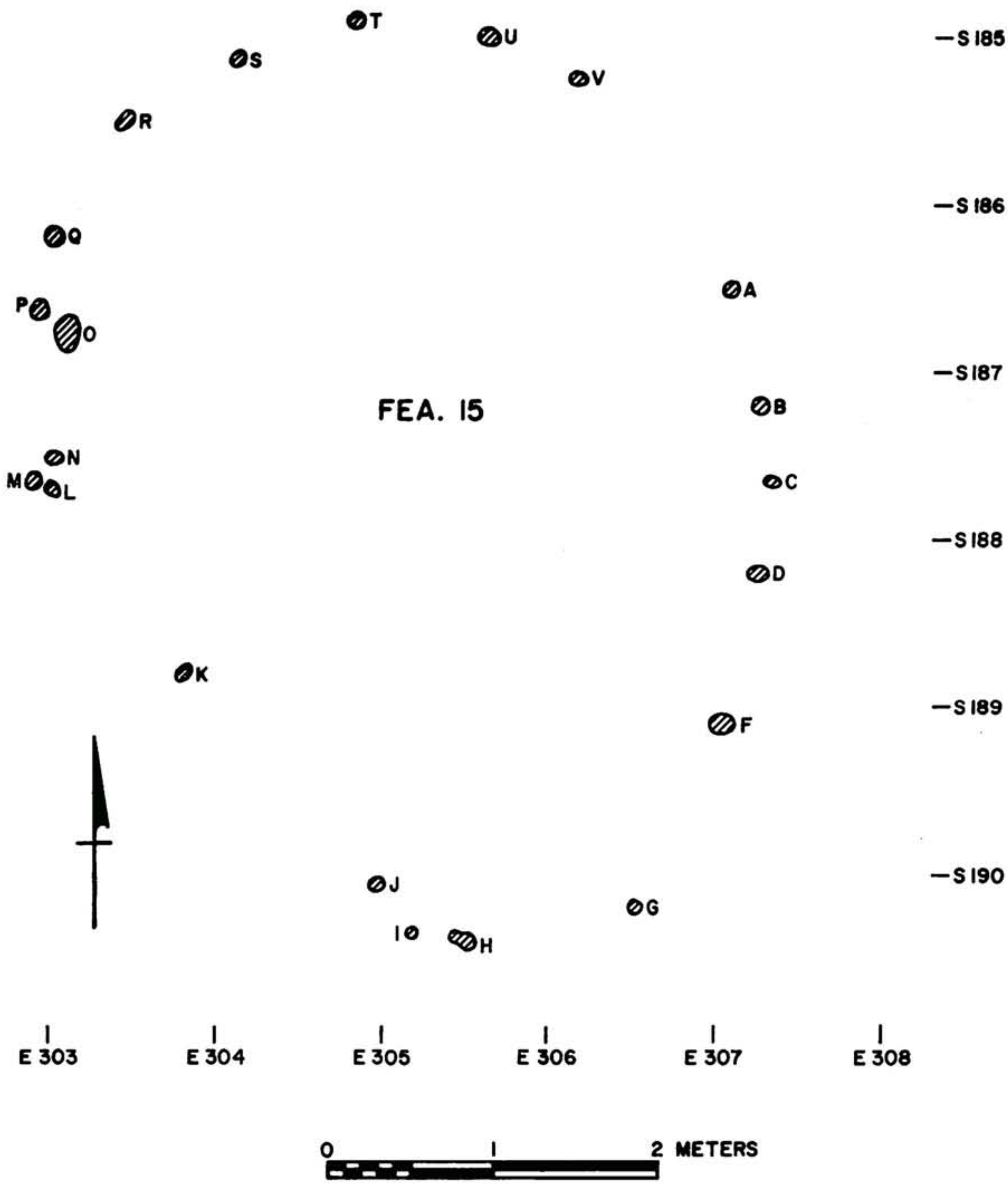


Figure 18. Site 38BK235: Feature 15 (structure) postmold pattern in plan.

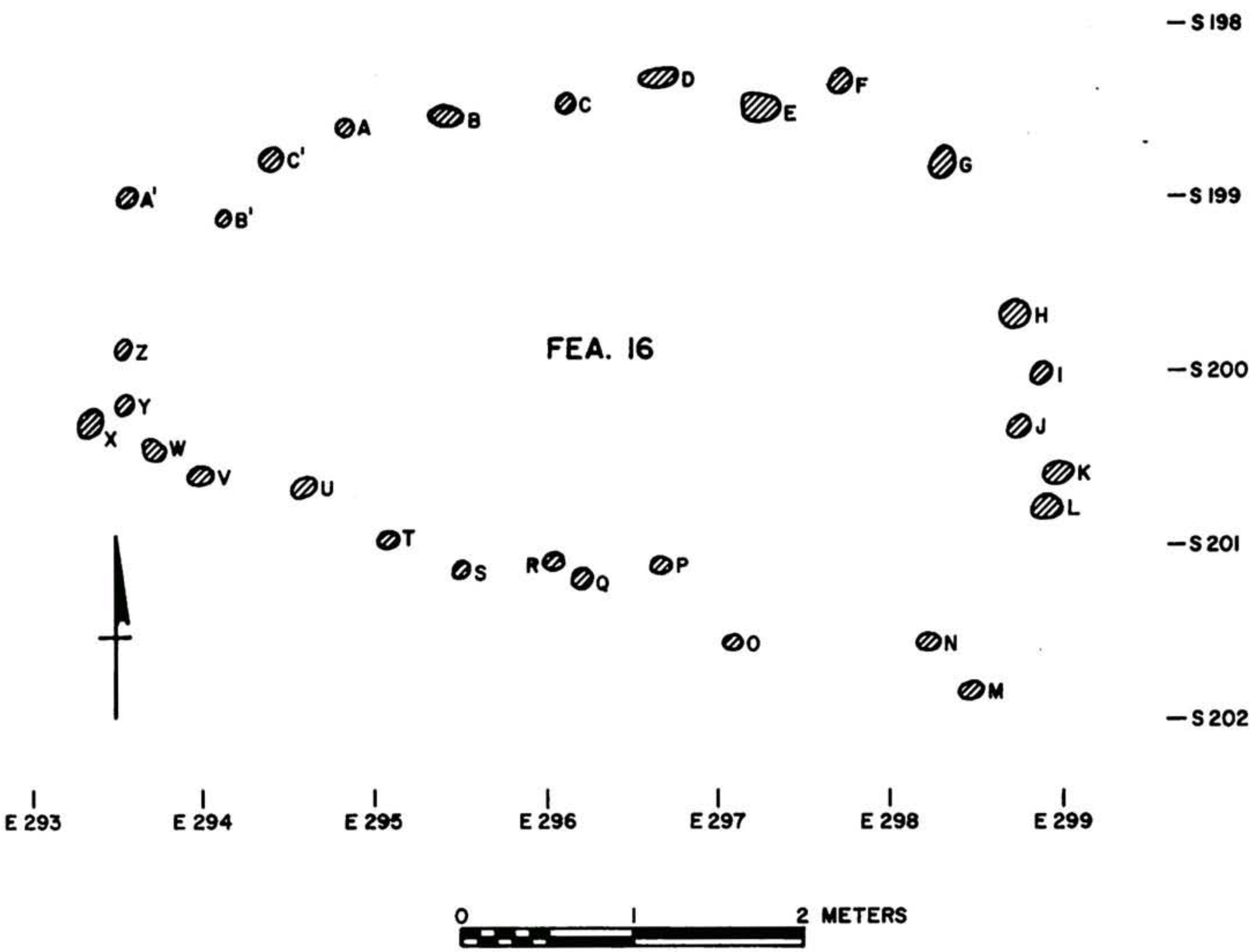


Figure 19. Site 38BK235: Feature 16 (structure) postmold pattern in plan.

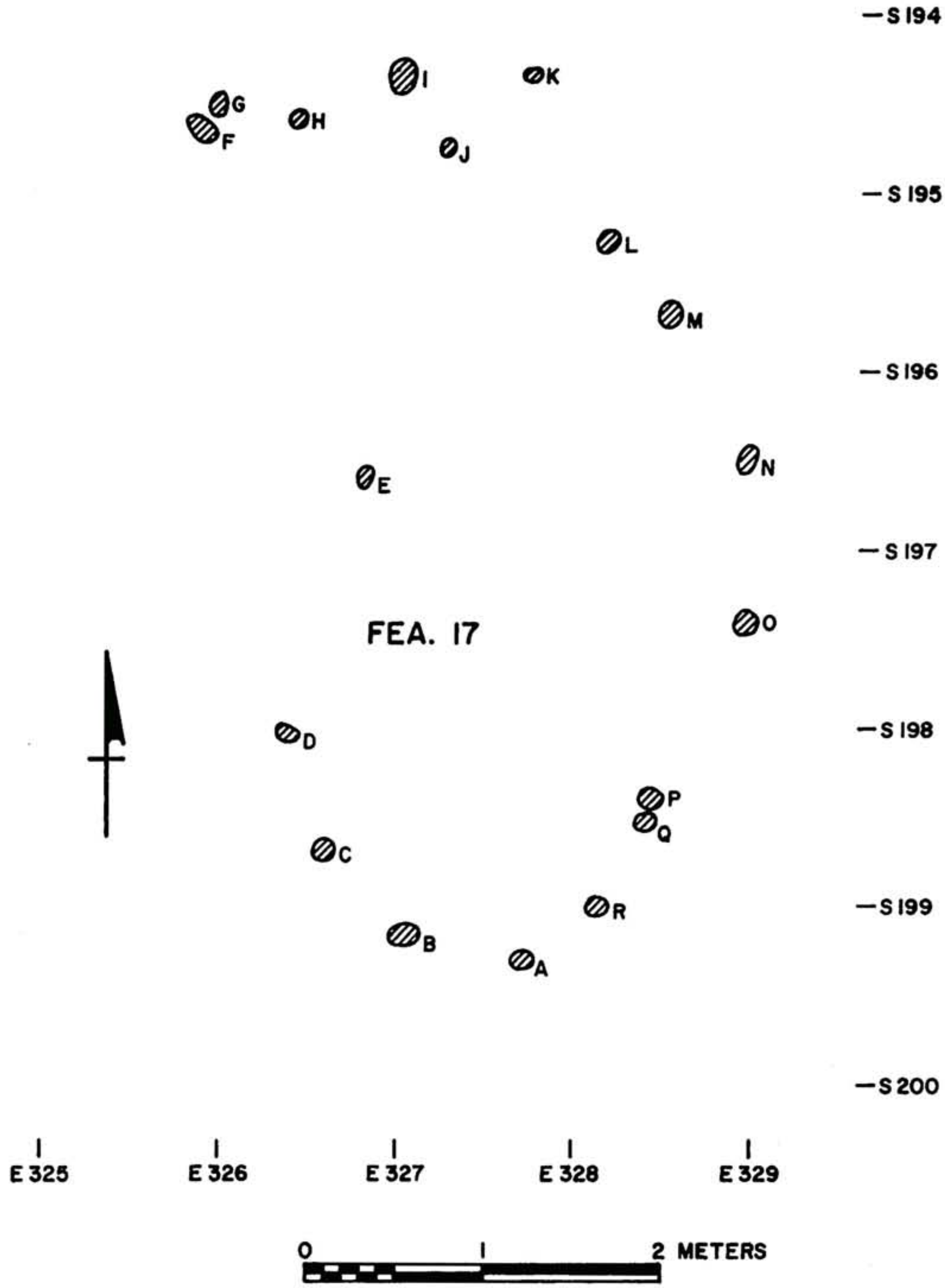


Figure 20. Site 38BK235: Feature 17 (structure) postmold pattern in plan.

TABLE 2

FEATURE 14BB SUBFEATURES WITH ASSOCIATED MATERIAL

Subfeature	Associated Material
T'	Dog, turtle, dogwood, red stains, blue-green stains; 6 humans (1 35+ years)
V'	Raccoon; yellow stains
X'	1 unknown stemmed biface, 1 utilized flake, red stains, non-grass phytoliths, (no identifiable human bone)
Y'	1 Kirk corner-notched biface, grape, turtle, 9 humans (1 male)
K', KK	1 Savannah River biface, 1 unknown stemmed biface, 1 atlatl fragment, blue-green stains, (no identifiable human bone)
H', HH	1 non-hafted cutting tool, 3 turkeys, turtle, deer
W	1 hammerstone, turtle, blue-green stains, wood (pine)
F'	red stains, grooved bones

The stains suggest organic refuse, perhaps resulting from human occupation or in situ decay of materials. They may have been used for anything from temporary sheltering of people and/or goods from the elements to specialized tasks involving processing racks or scaffolds. Even though seemingly temporary, some repairs may have been effected. What few diagnostic artifacts there were, i.e., a Caraway biface and rectilinear complicated stamped sherd in Feature 16, suggest a Mississippian origin.

Feature 18 is a cache of four rounded, river-worn quartz cobbles with cortex, two of which exhibited possible wear (Table 1). This isolated feature was encountered at about 20 cm below ground surface in the medium yellow-brown sand matrix characteristic of that depth. The feature was pedestalled and the surrounding area shovel skimmed and trowelled. There were no soil stains or other artifacts associated with the feature. Consequently, the collection of soil samples did not appear warranted. The feature was mapped, photographed, and removed.

38BK236

Physical Characteristics

This Middle-Late Woodland site covers an oval area approximately 120 x 90 meters on top of and along the gentle slopes of a knoll overlooking a small stream (Fig. 21). The stream empties into the Santee Swamp about 300 meters northeast of the site. The site rises abruptly toward the southeast and southwest, from about 12.0 meters above sea level at the stream edge to approximately 18.5 meters at the crest of the knoll. The most intensive occupation occurred on the relatively flat to gently sloping area on top of the knoll, ranging from 18.5 to 21.0 meters above sea level.

Soils on the site are of the Norfolk and Bonneau soil series, characterized by relatively deep, well- to moderately well-drained loamy sands (Charles E. Glover, Jr., Soil Conservation Service, personal communications; Berkeley County Soil Survey 1980). As indicated by subsurface testing and excavation at 38BK236, these soils vary in depth from about 25-30 cm on the top of the knoll to 40+ cm along the slopes. Although recent timbering had disturbed the surface of the site, mixed hardwoods and long-leaf pine, characteristic climax vegetation associated with such soils (Quarterman and Keever 1962), appear to have been dominant.

Phase I (Intensive Testing)

Initially, the remaining trees and large shrubs on the top and upper slopes of the site were cleared, making every effort to minimize additional site disturbance. This was followed by the preparation of a contour map and the establishment of a 10 x 10 meter grid system, originating at 100N, 100E, as a framework for conducting controlled surface collections and for the systematic placement of subsurface testing units over the site (Fig. 21--clear-cut limits indicated by solid, heavy lines).

All observed surface material within each 10 x 10 meter grid unit was collected. The intent of these collections was to obtain a first approximation of the spatial trends in the archeological materials. This information, in turn, was to be used for designing the subsequent subsurface sampling strategy. While the collection of materials from units of standard size (10 x 10 meters) was intended to provide comparable data, this was partially precluded by differential ground surface visibility, i.e., varying degrees of disturbance and grass/shrub cover. Nevertheless, it was observed that generally the highest densities of archeological materials occurred in the relatively high, flat area.

Specifically, indications were that the highest densities of both ceramic and lithic artifacts were located just above the crest of the knoll on the gently sloping west-central (vicinity of Block Excavation Area 1 to be discussed) and northeastern (vicinity of Block Excavation Areas 2 and 3 to be discussed) portions of the site. Subtle differences in the ceramics between the two areas were observed. The west-central area appeared to be dominated by Deptford ceramics, whereas the ceramics in the northeastern portion were primarily of the Cape Fear/Wilmington ware groups. This

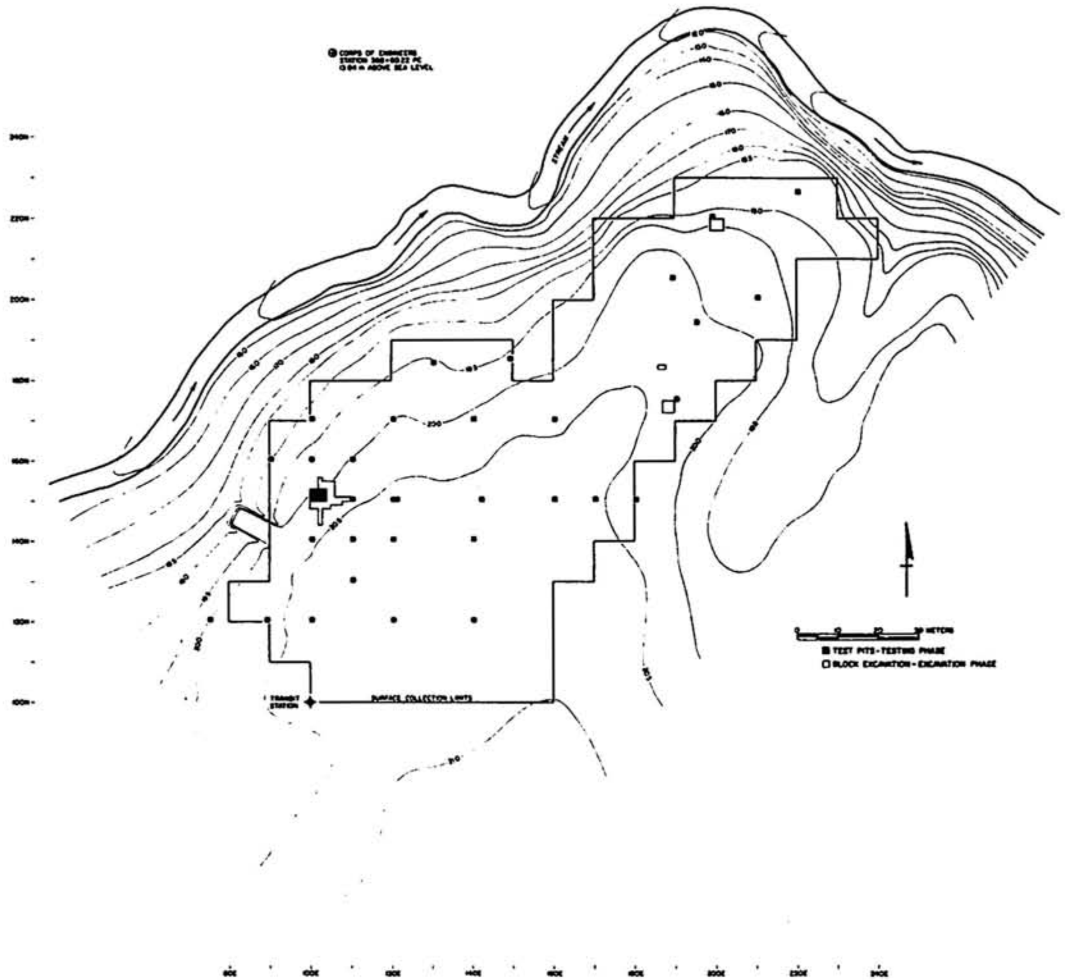


Figure 21. Site 38BK236: contour map showing locations of Phase I, intensive testing units (shaded) and Phase II, Block Excavation Areas 1-3.

pattern was subsequently confirmed by Phase I, subsurface testing, and Phase II, block excavations.

Sixteen 1 x 1 meter units were placed along the grid lines at 20-meter intervals east-west and 10- or 20-meter intervals north-south in order to disperse systematically the subsurface sampling units. Twenty additional 1 x 1 meter units were excavated in order to increase the dispersion and to investigate more intensively the higher artifact density areas that had been identified in the west-central and northeastern portions of the site (Fig. 21).

In the apparent absence of vertical separation or superposition of archeological materials, excavation was undertaken by shovel skimming and trowelling within 10 cm arbitrary levels, which corresponded rather well with the natural stratification. Excavation indicated that the top 10 cm of soil typically consisted of a medium-to-dark gray, loamy sand, humus zone. A transitional zone (Soil Horizon A), characterized by a mottled light gray and light yellow-tan, fine sand, extended from about 20-30 cm below ground surface. At about 20 cm, the soil graded into a light yellow-brown, fine sand, becoming lighter in color with depth. An orange-to-light red-brown, sandy-clay substrate was usually encountered between 30-40 cm below ground surface. In some instances, however, especially in the high, relatively flat areas of the site, the irregular substrate surface was encountered as shallow as 25 cm. Along the slopes of the site, the substrate was usually in excess of 40 cm.

The cultural material generally extended to a depth of 30-40 cm, concentrated between 10-30 cm below ground surface. Identifiable material was almost exclusively Middle-Late Woodland, consisting primarily of Deptford and Cape Fear/Wilmington ware. Based on context, most of the lithic artifacts and debitage, largely of orthoquartzite, was also associated with the Middle-Late Woodland period (Chapter 5).

Phase II (Block Excavations)

Introduction

During Phase I, a relatively dense concentration of Middle-Late Woodland, Deptford phase pottery (primarily simple and check stamped) was encountered in the west central portion of the site in excavation unit 150-151N, 100-101E. The sherds were in apparent association with the edge of a dark, midden-stained occupation surface, designated as Feature 1 (Fig. 22). In order to confirm the existence of such a surface, three adjacent units were excavated. While the artifact density in these units was not as high as in 150-151N, 100-101E, an occupation surface with possible postmolds was indicated. Consequently, the main thrust of Phase II was to expose and excavate Feature 1 (occupation surface and associated subfeatures) in its entirety. This resulted in Block Excavation Area 1 (Fig. 21).

Phase I subsurface testing also indicated that two areas in the northeastern portion of the site appeared to have slightly higher ceramic frequencies (primarily of the Cape Fear ware group). While no occupation surfaces or major activity areas were indicated, a more intensive examination than was possible during Phase I seemed warranted, especially in view of the largely unknown source(s) of variability between the Deptford, Cape Fear and Wilmington phases of the Middle-Late Woodland. It is known, however, that there was considerable temporal and regional overlap, with ceramics of these two phases occurring alone or in various combinations on sites in the interior Lower Coastal Plain (South 1976; Anderson 1975; Brooks 1980; Brooks and Scurry 1978). Therefore, in an attempt to shed light on this problem, Block Excavation Areas 2 and 3 were opened in the northeastern portion of the site (Fig. 23).

All Phase II investigations were tied into the Phase I grid system. However, for convenience and more precise vertical control, a local datum (transit station) was established at 145N, 100E, adjacent to Block Excavation Area 1. Excavation was conducted in 1 x 1 meter units, usually within arbitrary 10-cm levels. Soils were screened through one-quarter-inch hardware cloth, and soil samples were recovered from features, subfeatures, and selected excavation units (standard 10-liter volume) for later flotation and specialized analyses. Because of the poor preservation at this site and the lack of definitive features, no phytolith, pollen, or soil chemical analyses were subsequently undertaken. Instead, the available funds were channeled toward samples from 38BK235, which had higher potential for contributing additional information. No bone was recovered from the site. The occurrence of several burned stumps at the site indicated that wood charcoal obtained from 38BK236 would probably be contaminated, and no samples were submitted for dating.

Block Excavation Area 1

In the process of exposing and excavating Feature 1, occupation surface, 48 contiguous 1 x 1 meter units were excavated within the area of 144-156N, 100-110E (Figs. 23, 24). Forty-four subfeatures (1A-RR), consisting of possible postmolds, artifact concentrations, and various regularly- and irregularly-shaped soil stains (many probably resulting from root action), were discovered in association with the surface (Table 3).

During Phase I, the western edge of the feature was encountered. In Phase II, initial efforts were directed toward determining the extent of the feature to the north, south, and east. This was accomplished through excavating shallow trenches (contiguous 1 x 1 meter units excavated down to the contact with the occupation surface) outward from Phase I's 2 x 2 meter block to 144N, 156N and 110E (Fig. 22). With the approximate limits of the major portion of the feature defined, the intervening 1 x 1 meter units were excavated down to contact with the occupation surface (Fig. 23).

The occupation surface, characterized by medium-to-dark yellow-orange-brown sand (leached midden) with gray mottling and considerable charcoal flecks, was approximately 5 cm thick. It originated just below the humus zone, at about 10 cm below ground surface, and terminated on top of a light yellow-brown sand at 15-20 cm below ground surface. The soil outside the feature, at a depth comparable to the occupation surface, was a light

Figure 22: Site 38BK236: Phase I, intensive testing unit in which Feature 1 (possible structure) was initially discovered. View looking east.

Figure 23: Site 38BK236: Phase II, Block Excavation Area 1 showing Feature 1's occupation surface. View looking north.

yellow-brown sand with gray mottling (natural Soil Horizon A, below the humus zone).

After Feature 1, occupation surface, was initially defined and exposed, it was carefully trowelled. Exposed artifacts and subfeatures were mapped and removed. Subfeatures (Table 3) were excavated by cross-sectioning and/or complete excavation. The entire contents of the smaller subfeatures, e.g., postmolds, were saved for flotation and special analyses. One or more standard 10-liter soil samples were obtained from the larger subfeatures, and the remaining soil was screened.

Once all subfeatures had been removed, the remaining occupation surface was excavated by shovel skimming and trowelling within each 1 x 1 meter unit until the dark "midden stain" was gone. Exposed artifacts were mapped and removed. During excavation, soil samples were obtained from the fill of the occupation surface in each unit for flotation and special analyses; the remaining soil was screened. In order to provide a body of comparable data, units outside the feature were excavated in the same manner to depths equivalent to the base of the occupation surface.

Little can be said with any certainty about the possible structure(s) associated with Feature 1, occupation surface. The various subfeatures, particularly 1-O (possible wall trench with associated posts), suggest a rather ephemeral "D-shaped" structure oriented northeast-southwest (Fig. 24). The absence of hearths, storage/refuse pits, etc., suggests not only that the structure(s), if it existed, was rather ephemeral, but also that the occupation was short-term, perhaps seasonal. Similarly, the apparent absence of other structures and/or midden-like occupation surfaces at 38BK236 would indicate that the site was likely occupied intermittently by small groups. Feature 1, occupation surface, does strongly suggest, however, that some activities conducted at 38BK236 were of an intensive nature, even if intermittent and of short duration.

Artifacts associated with Feature 1 consisted largely of moderate densities of Deptford phase ceramics (primarily linear check and cross simple stamped sherds) and, based on context, Deptford lithic artifacts (primarily orthoquartzite bifaces and debitage). A few cord-marked sherds, generally attributed to the Cape Fear/Wilmington phase of the Middle-Late Woodland, were also present. Assuming that Feature 1 resulted from use by a given small group, it may be that the Deptford and Cape Fear/Wilmington wares from Feature 1 are locally contemporaneous. If so, it would appear likely that at least some of the variability between the Deptford, Cape Fear and Wilmington phases may be partly functional. Many of the above issues could have been resolved, or at least addressed in a more definitive manner, had it been feasible to obtain a series of C-14 dates from Feature 1.

Block Excavation Areas 2 and 3

Block Excavation Areas 2 and 3 were both 3 x 3 meter blocks (172-175N, 187-190E and 217-220N, 199-202E, respectively) consisting of 9 contiguous 1 x 1 meter excavation units (Figs. 21, 25, 26). Excavation in both blocks was by shovel skimming within 10 cm arbitrary levels to a depth of 30 cm. The soil was screened and soil samples were obtained from a few selected

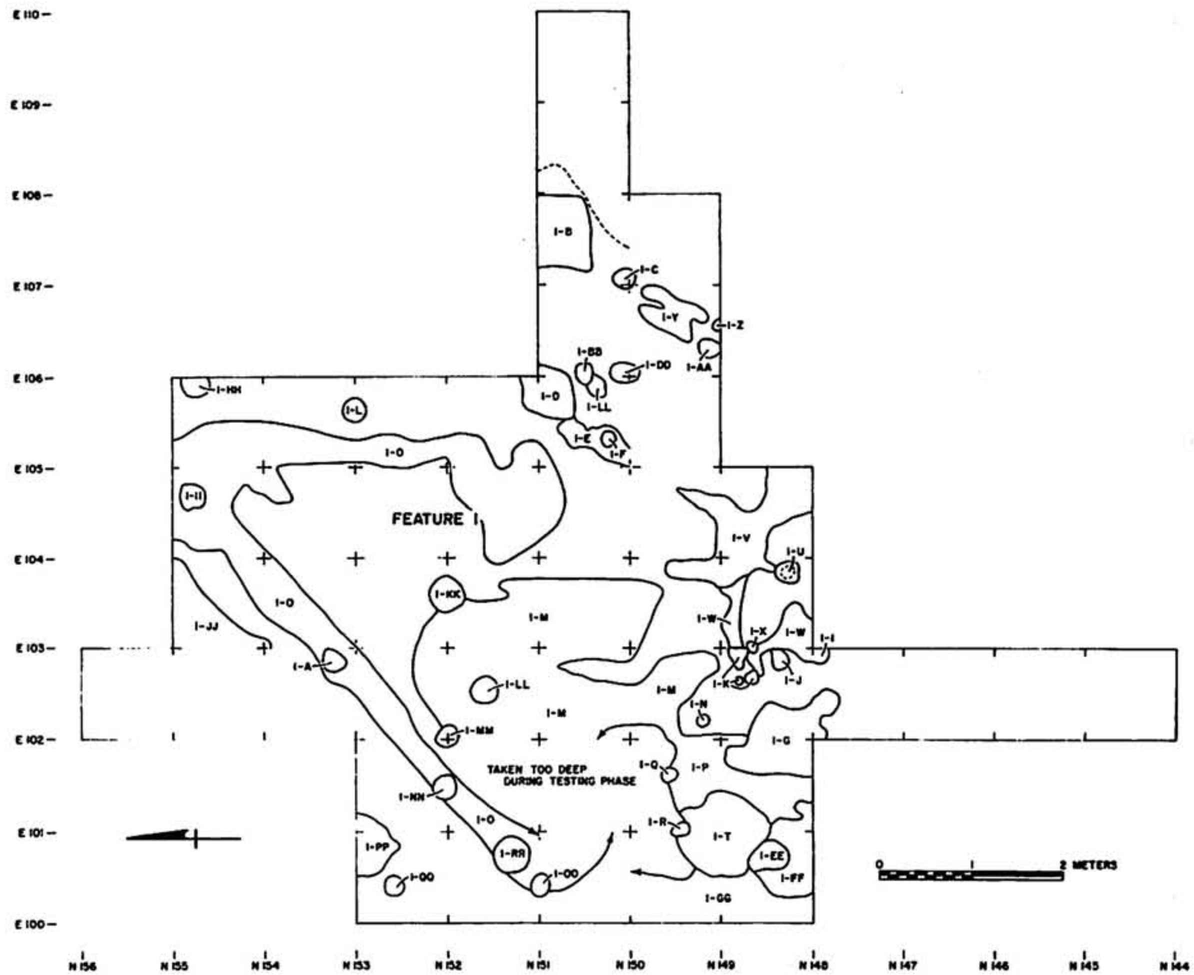


Figure 24. Site 38BK236: Phase II, Block Excavation Area 1 showing location of Feature 1 (possible structure) and associated subfeatures.

TABLE 3
38BK236-Feature 1; Possible Structure

Feature #	Type Feature	Maximum North-South Dimension	Maximum East-West Dimension	Depth (M.B.D.)	Vert. Morph	Fill	Contents	Comments
1-A	Circular art. concentration	.25m	.25m	2.02-2.09	Lenticular	Mottled med. brn.-tan gray sand	Sherd & debitage concentration	
1-B		.60m+	.85m	1.79-1.85	Lenticular	Mottled yel.-brn, med.-fine sand		
1-C	Circular; poss. postmold	.25m	.25m	1.85-2.57	Sloping sides; rounded bottom	Dark gray-brn.,med. textured sandy soil		
1-D	Circular Stain	.60m	.60m	1.88-1.93	Shallow, lenticular	Dark gray-brn. sandy soil		
1-F	Amorphous stain	.80m	.40m	1.88-1.90	Lenticular	Dark gray sandy soil		
1-F	Circular; poss. postmold	.20m	.20m	1.86-	Sloping sides rounded base	Dark gray sand soil		
1-G	Amorphous stain	1.25m	.95m	1.94-1.98	Shallow; Lenticular	Dark gray sand soil	Linear check stamped & cross-simple stamped sherd concentration in S.E. lobe.	Soil becomes mottled, med. yellow-tan-gray sandy soil with charcoal flecks in S..E. lobe.
1-H	Amorphous stain	.50m	.40m	2.00	Shallow, lenticular	Greasy, Dark gray, med. sand with charcoal flecks		Part of Feature #1-0
1-I	Amorphous stain	.20m	.20m	1.95-	Shallow, lenticular	Med. gray sandy soil		Part of Feature #1-W
1-J	Circular Art. concentration	.20m	.25m	1.95-	Shallow; lenticular	Med. Textured yellow sand	Simple and check stamp ceramics	
1-K	Circular stains, post-molds	.10-.20m	.10-.20m	1.95-	Shallow; lenticular	Dark brown, med. text. sand		Three seemingly related stains
1-L	Circular stain, poss. postmold	.25m	.25m	1.98-2.32	Sloping sides rounded base	Greasy dark gray sand with charcoal flecks		
1-M	Large amorphous stain	3.00m	3.00m	1.89-1.94	Shallow, lenticular	Mottled, gray-tan brown sand with charcoal flecks	Cross-simple st. sherd	
1-N	Circular stain poss. postmold	.20m	.20m	1.95-	Sloping sides, rounded base	"	No material	
1-0	Structure edge or wall trench	.40m	.40m	1.95-2.30	Sloping sides rounded base	Dark gray to brown med. to coarse sand with charcoal flecks throughout		
1-P	Amorphous stain	1.50m	.80m	2.00-	Shallow, lenticular	Mottled gray-yellow sand with charcoal flecks		Part of feature 1-N
1-Q	Circular stain, poss postmold	.15m	.15m	2.00-	Sloping sides, rounded base	"		
1-R	Circular stain, poss postmold	.20m	.15m	2.00-2.07	Sloping sides, rounded base	"		
1-S	Deleted -- Burned tap root/stump --							
1-T	Lge, Circular, stain	1.05m	.95m	1.88-2.05	Shallow, lenticular	Red-brown sandy clay		

TABLE 3 (Cont.)

Feature #	Type Feature	Maximum North-South Dimension	Maximum East-West Dimension	Depth (M.B.D.)	Vert. Morph	Fill	Contents	Comments
1-U	Concentric circular stains-poss postmold	.25m	.25m	1.86-	Shallow, lenticolar	Dark gray sand		Probably result of recent root action
1-W	Amorphous stain	1.0 m	1.10m	1.90-	"	Mottled gray-brown sand		
1-X	Circular stain, poss postmold	.15m	.15m	1.90-	Sloping sides, rounded base	"		
1-Y	Amorphous stain	.75m	.65m	1.84-	Shallow, lenticular	Dark gray sand		Probably result of recent root action
1-Z	Circular stain, poss. postmold	.10m+	.15m	1.83-1.93	Sloping sides, rounded base	Med. gray sand		
1-AA	Circular stain, poss. postmold	.25m	.20m	1.84-2.03	Sloping sides, rounded base	Dark gray sand		
1-BB	Circular stain, poss postmold	.20m	.25m	1.85-	Sloping sides, rounded base	Med. gray sand		
1-CC	"	.20m	.25m	1.85	"	Med. gray sand with yellow mottling.		
1-DD	"	.30m	.25m	1.85-	"	Med. gray sand		
1-EE	"	.45m	.35m	1.95-2.01	Shallow, lenticular	Dark gray snad		
1-FF	Roughly stain	.70m+	1.00m	1.95-	"	Red-brown sandy clay		
1-GG	Large, amorphous stain outside edge of structure	2.00m+	.60m	2.01	"	Mottled yellow-tan-gray sand		
1-HH	Circular stain	.35m	.25m	1.97-2.02	Shallow lenticular	Med. gray sand		
1-II	Circular stain, poss. postmold	.30m	.25m	1.98-2.09	Sloping sides, rounded base	Dark gray-brown sand		A major support post?
1-JJ	Lge. Amorphous stain, outside edge of structure	1.05m+	1.00m	2.02-	Shallow, lenticular	Dark gray-brown sand		Just below humus zone
1-KK	Circular stain, poss. postmold	.40m	.40m	1.97-2.03	Sloping sides, rounded base	Dark gray sand		A major support post?
1-LL	"	.30m	.30m	1.96-2.16	"	Dark gray sand		"
1-MM	Circular stain	.30	.25m	1.98-2.25	Sloping sides, pointed base	Dark gray sand		Irregular shape & orientation suggests root mold
1-NN	Circular stain poss. postmold	.25m	.25m	2.08-2.19	Sloping sides, rounded base	"		In wall trench?
1-OO	"	.25m	.25m	2.07-2.19	"	"		"
1-PP	Roughly circular stain	.50m+	.70m	2.11-2.21	Shallow, lenticular	"		
1-QQ	Circular stain poss. postmold	.20m	.20m	2.13-2.17	Sloping sides, rounded base	Dark gray-brown sand		
1-RR	"	.40m	.40m	2.05-2.22	"	"		A major support post? In wall trench?

units and levels for flotation and special analyses. Because of the natural soil characteristics discussed earlier, obtaining more extensive, special samples from a nonmidden context was not justified.

The stratification in both block areas was entirely natural and quite uniform throughout, varying little from that described for Phase I, subsurface testing. Essentially, the only notable difference in stratification between the two blocks was that the substrate had been encountered in the southern end of Block Excavation Area 3 at 30 cm, but not in Block Excavation Area 2.

Although there was no apparent vertical separation or superposition of archeological materials in either block, artifacts and lithic debitage were concentrated at 15-25 cm below ground surface. Material, while present, was very sparse at 30 cm.

Archeological material from both blocks consisted primarily of a few sherds (largely sand-tempered plain and fabric-impressed) and a moderate amount of orthoquartzite lithic debitage. Block Excavation Area 3 contained a few biface preforms (morphological appearance resembles Guilford) in apparent association with the Middle-Late Woodland ceramics. No features or obvious artifact concentrations were observed in either excavation block.

Comparative Summary

The feature data from sites 38BK235 and 38BK236 may be used to compare the intensity of the habitation and functionally distinct loci. The hypothesized limited habitation of 38BK236 was expected to result in less well-defined activity areas, whereas site 38BK235 was expected to have a definitive Mississippian component that would reflect functionally specific use areas. Unfortunately, the excavation of the two sites was not comparable relative to the potential for discovering features. No grading occurred at 38BK236; all excavation was accomplished by hand. Time constraints and the discovery of an unforeseen Mississippian structure influenced the use of heavy machinery at 38BK235. Site 38BK236 (10,800 m^2) was about one-third the size of 38BK235 (32,040 m^2). Considering the three block excavation areas and the 20 x 20 meter controlled graded surface, approximately 2% of the surface area at 38BK235 was exposed and intensively investigated. The block excavations at 38BK236 accounted for .6% of the surface area. Time and soil conditions also affect the preservation and definition of features. Earlier temporal components (38BK236) and sites located on slopes (38BK236) experience greater disturbances. Because of these two admonitions about the comparison, the following discussion emphasizes the functional implications of the features, which will be tested further with the assemblage data and future research in the interior.

One feature was identified at 38BK236. It proved to be an irregularly shaped, leached midden stain, indicative of an activity area. Several aligned postmolds and a possible wall trench suggested a D-shaped structure. No hearths or storage pits were identified. The situation is quite different at 38BK235. A total of 11 Mississippian features was identified

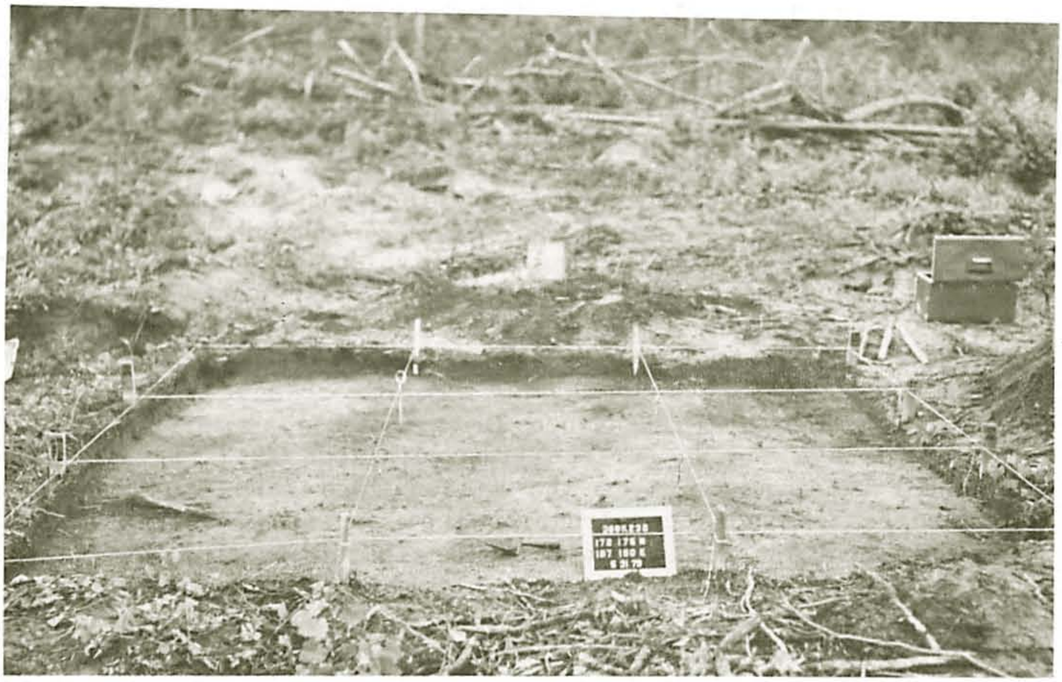


Figure 25. Site 38BK236: Phase II, Block Excavation Area 2 at 10 cm. View looking east.

Figure 26. Site 38BK236: Phase II, Block Excavation Area 3 at 20-30 cm. View looking west.

in the field. There were three distinctive types of structural and subsurface features as well as two artifactual finds. One feature (Feature 11-12) was identified as a Middle-Late Woodland pit.

Site 38BK236, located adjacent to a small stream, lies 300 meters away from the swamp. Positioned at the highest elevation before the land slopes toward the terrace, it is situated on an edge with equal access to the uplands and river swamp. Occupation is expected to be seasonal, perhaps repeated in yearly rounds. Substantial dwellings and storage pits might be expected at base camps in a "wintering over" context. The absence of a hearth or storage pit is interesting and might suggest occupation in a warmer season, i.e., a summer base camp. Temporary structures, cached items, and hearths would still not be out of place in such a context.

The midden area (Feature 1--ca. 30 m^2) at 38BK236 is substantially smaller than the midden stain (Feature 7--ca. 50 m^2) at 38BK235. Whether Feature 1 represents a living surface or specialized activity area is not clear. The northwestern edge of the midden does seem to show a clear demarcation, suggesting some construction that confined activities in the area. The Woodland pit, found at 38BK235, indicates that pits may not necessarily be located adjacent to recognizable (Woodland) midden areas. The fact that a midden was at all recognizable at 38BK236 suggests a build-up of organic debris sufficient to withstand erosion. From the size of the area, reoccupation by small groups rather than a single gathering of a large population is suggested.

Site 38BK235 is situated at the edge of the terrace overlooking the Santee Swamp. No extensive midden deposits were located during the excavation and grading. Whether this site is an isolated incidence or whether similar occupations occur in the vicinity is impossible to predict on the basis of the survey data. These structures were found only after extensive subsurface testing and stripping had taken place. Three different types of features will be discussed: Feature 7 in combination with Feature 1; Features 4, 5, 6, 10, 14BB; and Features 14AA, 15, 16, 17. They will be reviewed and evaluated both in a social and domestic context and in a socioreligious and/or sociopolitical context.

Feature 7 was tentatively identified in the field as a Mississippian house (Main House) on the basis of the midden staining, postmold outline, and a central hearth (Feature 1). Further analysis supports this initial interpretation, though its association with pits filled with human bone may indicate an overlying ceremonial function such as a caretaker's dwelling. Other possible functions of isolated structures, structures outside of towns, are also suggested in the ethnohistorical literature. One such account of Husquenawing described by John Lawson (Harriss 1952: 253-254) will be considered.

The assemblage recovered from the floor of Feature 7 does not suggest any obviously specialized items (Table 1--complicated stamped and plainwares; bifaces, scrapers, and debitage). A charred pipe bowl fragment and pipe stem were found inside the structure, north of the hearth area. The structure's isolated position is not disconcerting in view of recent investigations into Mississippian settlement patterns (B.D. Smith 1978), which reveal that small homesteads or hamlets dispersed along the floodplains may have been a common residential unit (Muller 1978). The Inca's account of DeSoto's journey through this part of the southeast mentions such isolated homesteads (Varner and Varner 1951: 182). As noted in Chapter 2, several early South Carolina chroniclers describe dispersed village houses interspersed among forest trees, like plantations. Such plantations would be difficult to detect archeologically, and their composition and size, at best, is a guess.

At the turn of the 18th century, Lawson (Harriss 1952: 187) describes Carolina Indian cabins:

> They were round, often oval, and bark-covered. After stripping off the bark and heating the poles fashioned from cedar, hickory, or other flexible wood, the Indians stuck them into the ground about two yards across from one another, bending them and tieing the ends together with elm or moss. These and the supporting poles that were added were covered with the bark of cypress, cedar, and even pine.

Le Moyne's illustrations of the early contact houses at Port Royal correspond to Lawson's description: round with a domed roof and one entrance (Waddell 1980: 45). Regrettably, no dimensions are provided. Instead, the larger state houses are described, e.g., the Escamacu state house described by Hilton in 1663 as approximately 22 meters in diameter, 200 feet around with walls 12-foot high (Waddell 1980: 45). These structures would have had a floor space of between 350 and 400 square meters.

Waddell (1980: 45, 47) suggests that the domestic structures would have been large enough to house an extended family of 20 members. Based on an average floor area of 10 square meters per person (Narroll 1962; LeBlanc 1971, but compare Wiessner 1974), such a structure would have had to have been on the order of 200 square meters, or about half the size of the state house. Rogel (Waddell 1980: 47) observes that the families journeyed inland for nine months of the year, but does not indicate whether shelters were erected.

Feature 7 is only about 50 square meters and would probably have accommodated less than 20 people, although Lawson (Harriss 1952: 187) indicates that several related families lived in cabins measuring two yards in diameter. A smaller figure compares more favorably with the Indian groups living in the interior, in the Piedmont and mountains. Calculating populations based on six persons per dwelling compares favorably with independent estimates derived from the census of gunmen in Creek towns (Canouts 1971; Swanton 1922: 210). However, the house structures in the interior, while approximately the same size, tended to be more elaborate (Bartram in Harper 1967). Hally (1981) excavated three structures (Barnett Phase, A.D. 1500+) at the Little Egypt site in the Georgia Piedmont. They measured 7 to 10 meters on a side, squared off with central support posts. Dickens' (1976: 32ff) excavations at Warren Wilson in the mountains of North Carolina uncovered houses averaging 7 meters square, with entrance trenches and inner and outer walls.

Specialized functions involving isolated structures or cabins would be hard to distinquish if there were associated domestic maintenance activities as well. For example, Lawson (Harriss 1952: 253-254) describes a large, strong cabin standing outside the town where young people were taken to learn obedience. About 20 or more young men (young women also had their turn) would be confined to the darkened interior for five to six weeks. Their jailors half-starved them, feeding them intoxicating plants. What little meat they consumed was mixed with "filth." This Husquenawing occurred once a year or once every two years.

Whatever else occurred, it seems evident that some domestic activities took place in Feature 7. The nature and extent of subsistence-related activities and the duration of the occupation are difficult to assess. The absence of midden stains around the structure does not necessarily indicate a limited occupation, for accumulated trash could easily have been dumped over the terrace edge into the swamp.

The total number of individuals found in Features 4, 5, 6, 10, and 14BB is too great to be accounted for by a single domestic dwelling. However, Features 4, 5, 6, and 10 are distinctly different from Feature 14BB in size and location, and they could be directly associated with Feature 7 as a domestic grouping. The condition of the bones and matrix in all five of the pits is similar, suggesting similar treatment but a different scale of disposition. The treatment of the dead is discussed in more detail in Chapter 6. For now, it is sufficient to note that Feature 14BB resembles the emptying of a charnel house with a large population that accumulated over a long period of time; or the burial of a population that was subjected to some catastrophe. The smaller pits suggest either the disposition of the remains at or near the time of death or the accumulation of individuals from a very small population, which does not seem feasible. One anomaly in Subfeature C', Feature 14AA, suggests disposal in the same pattern as the smaller features.

There is a possibility that the many individuals in Feature 14BB represent a major catastrophe, such as natural disaster, war, disease, or even cannibalism. In context with animal bone (Feature 14BB), although deer bone, turkey bone, and turtle shell have a number of nonfood uses (Swanton 1946: 249-252), human flesh may have been considered a food item, although it was usually eaten in a ceremonial context. Dogs, also identified in Feature 14BB (Chapter 6), were also eaten at ceremonial feasts (Swanton 1946: 2-9). There is one early historic account of a group of Westo Indians living on the Savannah River who, in raiding the low country, earned the reputation of "man eaters," perhaps, although this is unclear, as a consequence of their ferocious warfare (Milling 1969: 39; Cheves 1897: 166, 223-224).

Based on ethnographic and ethnohistorical accounts, Feature 7 does not appear to have functioned as a mortuary house or a place to store human bone. Early explorers identified these structures as temples, royal tombs, and special houses and cabins where bones were stored in boxes and hampers or where the skeletons were rearticulated and laid out (Swanton 1946: 718-729). At least one account by John Lawson (Harriss 1952: 192-193) describes a raised building or loft, and John White draws such a scaffold for the North Carolina Algonquin Indians (Swanton 1946: Plate 86). It seems more likely that Features 14AA, 15, 16, and 17, but not Feature 7, might represent the remains of scaffolds, and are related directly to Feature 14BB.

Scaffolds were used extensively in funeral rites for the preparation of the dead. For example, the Choctaw lit small fires under the scaffold while mourners wept for several days (Swanton 1946: 726). The fire hastened the decay of the flesh, which the "buzzard man" cleaned from the bone. Such scaffolds would have had to have been built larger for the treatment of several individuals. No burned sand was encountered in the vicinity of the structures, but it is doubtful that a slow smoldering fire of a few days' duration would leave traces in these soils.

At the same time, the faint discoloration of the soil inside the structures indicates that some activity occurred on the ground surface. The double pattern of several posts may indicate that the posts were replaced after rotting or burning in place. Lawson (Harriss 1952: 187) also describes other structures: Reed Hurdles, like tables, which were used to lie on in the summer and cabins built to hold grain, skins, and other stores. Lofts or above ground storage areas could appear ephemerally in the archeological record.

In conclusion, the two sites do not lie far from one another, approximately one kilometer on a straight line. Yet, 38BK236 is positioned at the upland edge and 38BK235 is located on the terrace edge of the Santee River floodplain. Feature 7, with its associated hearth at 38BK235, is better defined and more complex than Feature 1 at 38BK236, although Feature 1 is less well-preserved than Feature 7. If Feature 7 and Feature 1 represent domestic living areas, then the Middle-Late Woodland and Mississippian occupations are at about the same level of magnitude, with 38BK236 possibly representing a small base camp of an (extended) family unit, and 38BK235, an isolated homestead for a group of similar size.

If the structure at 38BK235 is part of a larger settlement, this comparison does not hold. Then, the isolation of this structure may be due to the composition of dispersed village plantations; or to special ceremonial functions, possibly burial, positioned outside the town. The human bone in Feature 14BB strongly suggests a larger population pool. Feature 14AA, which is in such close association with Feature 14BB that they were indistinguishable until excavation was underway, suggests some direct association with the bone deposited in Feature 14BB. Its similarity to Features 15, 16, and 17 also argues for like functions, whether treatment of the dead or other activities. The bone disposed of in Feature 14BB in a relatively short period of time may be the result of cleaning a mortuary house or the result of a catastrophe. These alternative hypotheses will be evaluated further with data from the artifactual and paleoecological assemblage.

CHAPTER 4

A FUNCTIONAL ANALYSIS OF THE CERAMIC ASSEMBLAGES

Introduction

The advantages of extracting all possible functional information from archeological potsherds are obvious. If one can assume certain correlations between vessel function and form, and if ceramic sherds can yield reliable information on form and technological traits, then the vessel fragments found on a prehistoric site should provide insights into the nature, diversity, and distribution of activities performed on that site. The problem, of course, is that these are big "ifs." Form and function of the parent vessel are far from readily apparent from most archeological sherds. Though intended vessel function can be said to exercise certain widely accepted constraints on all aspects of ceramic form, attributes of different functional types can overlap to a degree that make functional types indistinguishable archeologically. Because of these obstacles, only a few American archeologists have ventured past the ceramic form/function frontier; and although initial results offer encouragement, such methodology as there is remains largely experimental.

The Functional Framework

The functional analysis of the ceramic assemblages at sites 38BK235 and 38BK236 was designed to examine the hypothesized differences between the subsistence strategies of Middle-Late Woodland and Mississippian populations (see Chapter 2). If Mississippian settlements in the Coastal Plain were more permanent, and their inhabitants dependent upon a more diversified economic base than their Woodland predecessors, this should be reflected in a greater variety of functionally specialized vessels. The function of a ceramic vessel is assumed to relate to its form or appearance and/or the context in which it is used.

Vessel form (size, shape, and composition) may relate directly to specific requirements associated with resource procurement or processing. Specific vessel types may be associated with different domestic activities, storage facilities, or use areas; with different secular or sacred contexts; or with demographic differences such as the number of people served. These differences correspond directly to the duration and purpose of the settlement within the larger subsistence/settlement system (see also Plog 1980). The Mississippian settlement is expected to exhibit a higher order of specialized, discernible activities because of long-term habitation. Thus, variability in vessels and vessel attributes is also expected (see Chapter 2).

Two lines of inquiry are necessary in order to establish vessel function. The first involves the use of ethnographic, ethnohistorical, ethnoarcheological, and experimental studies to document the relationships between vessel form, size, shape, composition, and use. The second inquiry relates to the difficulty of reconstructing vessels and contextual associations from archeological data sets. That is, the ceramic assemblages rarely contain whole vessels in unambiguous settings. The sherds that are recovered are usually broken, often eroded, and more often than not, recovered in "nonuse" contexts, due to cultural loss, breakage and discard, or natural disturbances.

Functional classifications may be drawn from the descriptions of different vessel types in the ethnographic and archeological literature. Accounts of the southeastern Indian groups indicate a wide range of vessel types:

Du Pratz (1758) on the Natchez:

> These women also make pots of an extraordinary size, jugs with a medium-sized opening, bowls, two-pint bottles with long necks, pots or jugs for bear's oil, which hold as many as 40 pints, also dishes and plants...(Swanton 1946: 549).

Dumont (1753) on the Natchez:

> ...all kinds of earthen vessels, dishes, plates, pots to put on the fire, with others large enough to contain 25 to 30 pots of oil (Swanton 1946: 549).

> ...they make all sorts of utensils of earth, dishes, plates, pans, pots, and pitchers, some of which contain 40 to 50 pints (Swanton 1946: 550).

Swan (1855) on the Upper Creeks:

> ...earthen pots and pans of various sizes, from one pint up to six gallons...these vessels are all without handles, and are drawn so nearly to a point at the bottom, that they will not stand alone. Therefore, whenever they are set for use, they have to be propped upon three sides with sticks or stones (Swanton 1946: 551).

Adair (1775) on the Chickasaw:

> They make earthen pots of very different sizes, so as to contain from two to ten gallons; large pitchers to carry water; bowls, dishes, platters, basons [sic], and a prodigious number of other vessels of such antiquated forms, as would be tedious to describe, and impossible to name (Swanton 1946: 553).

Archeological evidence of the variety of forms described is well illustrated in Holmes' (1903) major work, Aboriginal Pottery in the Eastern United States. In a study in northern Arizona, Braun (1980a) used southwestern ethnographic data to derive a 42-category ceramic classification based on rim diameter and neck constriction. These variables relate to "different frequencies of access and degree of containment security" that pertain to different domestic activities involving storage and food consumption. More recently, Braun (1978, 1980b) has been conducting research pertaining to changing vessel shape and construction relative to subsistence developments during the Late Woodland period in the Midwest and the Northeast. Globular, thin-walled vessels, which replaced elongated vessels, have greater heating efficiency and greater resistence to thermal shock (Braun 1980b: 96). Armchair speculations by Ericson, Read, and Burke (1972) also provide testable hypotheses about functional vessel type characterized by differences in morphology and paste. Marion Smith (1979a, b, 1981, 1982) has recently begun to model and test size-shape function correlates using both ethnographic and experimental whole vessel data. His methodological approach is significant because sherds, not only whole vessels, may also be characterized.

Five general form/function categories were abstracted from this literature. These functional types are cooking vessels, liquid or water storage vessels, dry storage vessels, transport vessels, and food-serving or open-processing vessels. Open processing was defined as food processing, other than cooking, where the worker must have constant access to the material in preparation. This need for access was assumed to require the same general type of vessel form as food serving. "Restricted" processing, such as brewing or steeping, was not specifically considered because these tasks could have been performed using either cooking or water storage vessels and, therefore, would not have necessitated a single, distinct vessel form. In order to correlate sherd attributes with vessel form, the functional properties of vessels were further subdivided into three categories: morphology, composition, and surface treatment.

Morphological Properties

The primary morphological variables considered were thickness, base form, orifice restriction, volume, and height-to-width ratio. Expectations of thickness were based on the postulated need for heat conductivity or durability of each type as well as expectations of base form founded on the need for stability. Orifice restriction, or the orifice-to-volume ratio, was predicated on the observation (e.g., Shepard 1968; Braun 1980a) that the degree of rim and neck restriction is directly related to the need for security of vessel contents and inversely related to the need for access to the contents. The closely related height-to-width ratio also involves the security of the contents, i.e., whether a vessel should be shallow or deep.

Using these criteria, a cooking vessel was expected to have, in comparison to its height and volume, a medium-sized orifice, large enough to permit ready access to the interior (Braun 1980a; Hariot 1972: 60), but not so large as to allow heat loss and evaporation of contents (Linton 1944). Its base would probably be round or pointed for ease of support in an open hearth and for maximum exposure of lower vessel walls to the heat (Linton 1944). According to Hariot writing in the late 1500s:

> After they haue set them vppon an heape of erthe to stay
> them from fallinge, they putt wood vnder which being kyndled

one of them taketh great care that the fyre burne equallye Rounde abowt (Swanton 1946: 554).

Since heat conductivity also increases with thinness of vessel walls, the most effective cooking pot would be expected to be one with very thin walls (Braun 1980b). This attribute, however, might be moderated by equally pressing needs for vessel durability or capacity (M. F. Smith 1980a), and it would also, as Braun (1980b) has pointed out, vary according to the type of cooking and intensity of heat desired. Thus, while a very thick pot might be inefficient to the point of nonutility, vessel walls on most cooking pots can be expected to range from thin to moderately thick.

Liquid storage vessels were expected to have small to medium orifice-to-volume ratios, with orifice size varying according to the need for regular access (Braun 1980a) as well as the size of the vessel, especially whether the vessel was small enough to pour rather than dip from it. To prevent spillage, some degree of neck constriction would be desirable even with a large jar (e.g., Russell 1908). The vessels would also require stable bases. How exactly that would have been effected is difficult to say, since a conoidal or round base if buried (Holmes 1903: 25) or supported could be as steady as or steadier than a flat one (Linton 1944). As Swan notes, the vessels of the Upper Creeks were supported on three sides with sticks or stones. Thick walls would provide insulation for long-term storage (Ericson, Read, and Burke 1972), but thickness might be less advantageous if the vessel were also used to fetch water for immediate use.

Vessels used for storage of dry foodstuffs, like liquid storage vessels, may be expected to have small to medium orifice-to-volume ratios with the size of the mouth dependent upon the relative importance of access versus security of the contents (Braun 1980a; M.F. Smith 1980a). This, in turn, would depend upon the nature of the contents and length of storage (Ericson, Read, and Burke 1972). Volume, also dependent upon the length of storage and quantity, might be expected to be large, with the possible exception of small seed jars. Dry storage vessels would also require a stable base. Thickness might vary according to the need for durability and protection of the contents from heat and cold.

Transport vessels can also be expected to have small to medium orifices and medium to large height-to-width ratios for ease in handling. Stability, again, would be an important factor; but in this case, rounded or flattened bases would probably be more practical than conoidal bases. This would permit the pot to be set down without elaborate propping. A moderate thickness would be a compromise between durability and lightness (compare Ericson, Read, and Burke 1972: 91). The ease with which the vessels were transported received comment by Hariot, "ant they Remoue them from place to place as easelye as we can doe our brassen kettles" (Swanton 1946: 554).

The final category, serving and open-processing vessels, is necessarily distinct from those outlined above, because it is the only one in which ease of access is more important than what happens to the materials while they are inside (Braun 1980a). Thickness would vary relative to specialized uses and the need to withstand rough handling (Ericson, Read, and Burke 1972), but it must be relatively shallow, with a wide orifice and a stable, round or flattened base (M.F. Smith 1980b; Hariot 1972: 61).

Table 4 summarizes the expected values for each functional category. Most of the categories overlap, with only a very few extreme or exclusive values. The unknown quality of most vessel types is volume, which can vary according to the size of the social groups using the vessels or the amount of materials routinely processed. Only dry storage vessels, which tend to be large to accommodate bulky items, and transport vessels, which have constraints of portability, have predictable volume parameters (M.F. Smith 1980b). Those few high or low values apparent on the chart may indicate a vessel's function when they occur, but are not necessary for the performance of any function except serving and processing. This category has either high or low values for every attribute except thickness and volume. Cooking, storage, and transport vessels all tend to have medium orifice-to-volume and height-to-width ratios, moderate or variable volumes, and moderately thick walls. This means that vessels in these functional categories could probably be used interchangeably, and that even when their users distinguished between them, they may often be indistinguishable archeologically.

TABLE 4

EXPECTED RANGE* OF FUNCTIONAL ATTRIBUTES OF CERAMIC VESSELS (after M.F. Smith 1980a: 38)

	Cooking	Liquid Storage	Dry Storage	Transport	Serving/ Processing
Orifice: Volume	0	-/0	-/0	-/0	+
Height: Width	0/+	0/+	0/+	0/+	-
Thickness	-/0	0/+	?	0	?
Volume	?	0/+	0/+	-/0	?
Base Form	Round/ Conoidal	?	?	Round/ Flat?	Round/ Flat

*/ = Separate values

- = Low Values
0 = Moderate Values
+ = High Values

Multifunctional vessel forms are expected to constitute major portions of the sherd assemblages at both 38BK235 and 38BK236. However, the morphological attributes of the Middle-Late Woodland assemblage are expected to be more homogeneous, consisting of vessels suitable for cooking but small enough to be easily carried, and perhaps constructed in such a way as to be usable in several other contexts. The Mississippian ceramic assemblage is expected to express more morphological variability with a number of vessels fitting additional criteria for specialized storage and serving and processing. There may also be differences in vessel number and size depending upon the duration of the Mississippian settlement and its number of inhabitants. Duration and settlement size are important considerations because vessel use and discard bias sherd distributional patterns. For example, seldom broken storage vessels may be underrepresented in archeological samples.

Compositional Properties

The composition of vessel paste is influenced by manufacturing techniques, which, in turn, are affected by the available raw resources, i.e., clay and temper, and the proposed vessel form and function (see Matson 1965; De Atley 1973; Shepard 1968; Ericson, Read, and Burke 1972; Bishop, Rands, and Holley 1982). Paste, as an analytical component, involves several attributes that can be qualitatively and quantitatively characterized (see also Rice 1976). The most common attributes appearing in a multidimensional analysis are those relating to texture, temper, hardness (rarely used), porosity, and color. These data provide information on raw material sources relative to local production, craft specialization, and exchange, and provide technological information relative to functional considerations, e.g., resistance to thermal shock and permeability.

Although morphological properties of size and shape provide some of the best evidence of vessel function, the composition of the paste may also relate strongly to form/function categories. Importantly, these data can be as easily analyzed on sherd fragments as they can on complete vessels (Shepard 1968). The correlation of paste with functional ceramic categories now is being examined in a number of recent behavioral studies (Rye 1976, 1981; Plog 1980).

Of the possible functional categories, the most apparent paste differences appear related to cooking vessels and water containers (Rye 1976: 113ff). For example, cooking vessels should be highly shock resistant in order to withstand repeated heating (between 300-500°C) and cooling. Dark colors or built-up carbon residues help retain heat. A relatively more porous and less finely textured paste achieves a higher resistance to thermal shock. Higher firing temperatures (before sintering or vitrification, Shepard 1968: 23) and large, relatively uniform temper results in higher porosity. Mineral grain size, temper density, and the type of temper inclusions can all affect porosity.

Although some minerals exhibit a low thermal expansion (see Rye 1976: 116ff), specific expectations about temper must be related to the available raw materials and the actual methods of construction. As pointed out by Bishop and others (1981), Rye's suggestion that crushed sherds used for tempering in the same clay would exhibit the same thermal expansion, and would thus be desirable, is not supported by examples from the American Southwest. There, crushed rock was used for tempering in cooking pots, and sherd tempering was found in noncooking vessels (Rodgers 1936: 31, 17; Plog 1977: 119-120).

One of the better examples of paste permeability is found in water containers. In hot, dry climates, a more porous paste allows water to cool through seepage and evaporation (Shepard 1968: 126; see also Fontana et al. 1962). The porosity of the paste would not necessarily relate to thermal shock resistance but would relate instead to the permeability or capillary structure. Water or liquid containers in temperate climates may not, in fact need not, exhibit such permeability.

Early ethnographic accounts describe the process of pottery making by various southeastern Indian groups (Swanton 1946; Holmes 1903). The Natchez processed their clay be removing grit from the dried clay, adding shell temper, and kneading it (Swanton 1946: 549-550). Creek informants recall women adding sand to clay if they could not find a clay that would not crack, and an Upper Creek informant stated that temper made of old pottery (grog) was stronger (Swanton 1946: 551-552).

Fashioning a flat piece to form the base of the pot, the women wound ribbons of clay, spirally, building up the vessel walls. Dumont described six- and seven-foot clay rolls or ribbons of variable thickness (Swanton 1946: 550). The Catawba and Cherokee rolled similar clay cylinders (Holmes 1903: 54, 56). They then smoothed the coil joints by rubbing the exterior and interior walls with a mussel shell (Creek, Swanton 1946: 551) or gourd shell (Catawba, Holmes 1903: 54). The inside surface was often finished by rubbing it with a small stone to reduce flaking just as the Creeks used grease to coat the insides of the vessels before firing to protect the surface from being nicked (Swanton 1946: 553).

The pots may have been dried in the shade, under the sun, or before a fire (Holmes 1903: 52); possibly some were inverted over a hot bed of coals to dry slowly (Swanton 1946: 553). After drying, the vessels were fired with fuel above the ground. Many groups turned the vessels upside down, heaping faggots or bark around the outside and, in many cases, completely covering the pot (Swanton 1946: 552-553). The preferred fuel was dry bark of hickory, oak, or poplar; sometimes dried grass and pitch pine were used, these different fuels producing a desired color (Holmes 1903: 54; Swanton 1946: 553). Control over the firing was achieved by positioning the pot relative to the blaze, rotating the vessel, and/or fueling the fire until the pot became red hot (Swanton 1946: 552).

After a vessel was sun-dried, the Cherokee heated the pot for three hours by the fire, then placed it in the fire, covering it with bark for three-quarters of an hour, and then inverted it over burning corncobs for half an hour until the inside was glistening black (Holmes 1903: 56). A Catawba woman sun-dried her pot for three days, smoothed it again, dried it before the fire for an hour, and finally fired it in her fireplace for one hour, renewing fuel as necessary until it was red hot (Holmes 1903: 54-55). There are few references to the manufacture of aboriginal pottery along the South Carolina coast; apparently the clay was good and was used to construct pots whose contents were boiled (Waddell 1980: 56).

The effects of manufacturing on paste and consequently vessel function, thus, include three basic steps, which have just been illustrated by these southeastern ethnographies: (1) procurement and processing of the clay; (2) construction of the pot; and (3) firing. Generally, the variability in the composition of the paste between the ceramic assemblages at sites 38BK235 and 38BK236 was expected to relate to raw materials and ceramic technology. If functional differences can be inferred from distinct distributions of paste attributes, related to morphology and/or surface treatment, then the question arises as to whether the correlated differences involving paste are the result of cultural manipulation of the clays or the natural constraints of the clays in the manufacturing process. Although the pottery in both assemblages was expected to be manufactured from local materials, the intensive use of the riverine zone resource base during the Mississippian period was expected to relate to the better manipulation of the local clays in terms of selection and technological enhancement. The occurrence of nonlocal materials might also be expected in the Mississippian pottery if increasing social complexity was manifested in any kind of craft specialization.

Surface Treatment Properties

Surface treatment has been considered more in terms of formal or stylistic than functional properties, e.g., the relationship of surface area to heat transfer or the welding of clay coils. Since design elements have proven to be spatially and temporally diagnostic, surface "decoration" has been influential in defining ware groups associated with distinct temporal periods and geographical areas. Very little work has been undertaken to distinguish between the functional and stylistic implications of surface treatment variables, e.g., the evidence of a noncooking function for painted pottery in the Southwest (Plog 1977: 105). Early ceramicists in the Southeast did not distinguish between functional and formal variables in their ceramic typologies (e.g., Griffin, ed., 1950). They relied heavily on contextual data for information about vessel use: "its function is normally ascertainable only through its context when recovered" (Sears 1973: 31). For example, Sears (1973: 32) finds Weeden Island pottery and associated decorated wares only in ceremonial contexts.

Although context plays a significant role in ceramic interpretation, determination of the functional aspects of surface treatment may play an equally important role; for example, does paddle stamping affect the bonding of the clay during vessel manufacture?

> It will be observed by one who attempts the manipulation of clay that striking or paddling with a smooth surface has often a tendency to extend flaws and to start new ones, thus weakening the wall of the vessel, but a ribbed or deeply figured surface properly applied has the effect of welding the clay together, of kneading the plastic surface, producing numberless minute dovetailings of the clay which connect across weak lines and incipient cracks, adding greatly to the strength of the vessel (Holmes 1903: 135).

A Creek informant said that the exterior surface of a cooking pot was roughened by a corncob, and corncobs were also used to smooth a newly fired pot before it had completely cooled (Swanton 1946: 552). Incising, however, seems to have been purely a decorative technique, as does inverting pots over the fire to obtain blackened interiors (Swanton 1946: 552; Holmes 1903: 55-56).

Distinguishing between functional and formal variables may also be important for seriation or other statistical applications. In order to select variables for statistical manipulations, a researcher should have some knowledge about those which are time-sensitive, those which are redundant, in that they measure the same phenomenon, and those which are behaviorally correlated. Present categories of surface treatment may not be as time-sensitive as originally thought. For example, the simple stamped sherds recovered from the Mattassee Lake excavations, which were part of the Cooper River Rediversion Project, date later than expected, ca. A.D. 1200 (630 ± 65 B.P. and 760 ± 110 B.P.--David Anderson, personal communication).

Functional attributes associated with such vessel aspects as restricted access, content security, or vessel porosity, may not have a range of variability equal to that for stylistic elements. That is, ways of manufacturing vessels to perform a particular function may be so constrained that there are few measurable variables with even fewer values. Therefore, formal variables rather than functional ones are expected to be more effective in analyzing distributional patterns related to organized activities.

Formal elements in the ceramic assemblages are expected to distribute more randomly in terms of activity loci at the Middle-Late Woodland site (38BK236) than in the Mississippian site (38BK235). Due to the rather limited nature of a Middle-Late Woodland occupation, different vessels are expected to occur anywhere on the site. In addition, any vessel displaying distinctive formal elements (for example, check stamping) may be associated with any number of different activities.

It is expected that formal elements may begin to be associated with activity areas in a nonrandom manner in the Mississippian period due to two factors: (1) repetition of the same activities, at the same site, over a period of time may bring about intrasite patterning with specific types of vessels becoming associated with specific activity areas; and/or (2) a larger population concentration may necessitate coding or patterning of information connected to particular functions or groups (see Wobst 1977).

Summary

Attention to these three sets of data results in a multidimensional approach to the study of vessel function. Variability, conditioned by these three sets of vessel properties, is generally expected to be greater for the Mississippian ceramic assemblage because of more intensive, complex subsistence activities and organizational strategies. Specifically, the Mississippian pottery should show (1) greater diversity in size and shape; (2) purposeful resource selection and better manufacturing techniques; and (3) nonrandom distribution of formal or stylistic elements by site in comparison to the Middle-Late Woodland ceramic assemblage.

Method of Analysis

A comparison of the Middle-Late Woodland and Mississippian ceramic assemblages was expected to yield small-scale functional differences. Even though the hypothesized subsistence/settlement patterns were expected to produce a higher index of ceramic diversity in the Mississippian than in the Middle-late Woodland period, this measure was relative. The various types of domestic activities performed in subsistence procurement and household maintenance appear very similar through time and space, e.g., food preparation and food consumption. This redundancy is further amplified because the activities at the two sites occurred in the same environs.

In the absence of a significant number of reconstructable vessels, or a notable amount of contextual data for inferring use, the investigation of this minimal variability depended upon an attribute analysis of the sherds. Sherds may exhibit direct use/wear attributes such as carbonized residue, repair holes, coil breaks, or wear polish, but these attributes occur too infrequently in archeological assemblages to be used to compare small-scale functional differences. Other attributes having higher observable frequencies were required to analyze the entire assemblage.

The approach, then, was (1) to select a number of functionally related morphological, compositional, and surface treatment variables that could be measured on a single sherd; (2) to measure those variables qualitatively or quantitatively such that a meaningful range of values could be extracted; and (3) to assess the differences on both macroscopic and microscopic levels within and between assemblages. A judicious compromise between the sample size and the intensity of the analysis was necessary.

Of the total 10,762 sherds recovered from the testing and excavation phases at 38BK235 and 38BK236, Haskell and Pearson analyzed 2,126 (20%). Depending upon the size of the sherd and the part of the vessel represented, between 8 and 15 macroscopic observations were recorded and these data entered in SPSS data sets in the University computer (Amdahl 470/V6; Data Supplement VI). An intensive study of the remaining 8,636 small body sherds under 3 cm in diameter was deemed inappropriate because of their limited potential for contributing decisive information. The selection of significant functional criteria by which they might have been typed and sorted could not be established prior to the functional analysis. These small sherds were counted and weighed by provenience to help define the artifact density patterns for various archeological units. Pearson conducted additional porosity tests and a microscopic analysis, using petrographic thin-sections and X-ray diffraction, for 96 sherds (ca. 1%) and 67 clay tiles fashioned from local clays gathered in the vicinity of the Cooper River archeological sites.

The morphological data set was emphasized in the macroscopic study since morphological attributes relating to shape and size provide the best evidence for inferring different functional types. Paste attributes and surface treatment were recorded, but received less emphasis because paste was being examined microscopically and because few functionally relevant expectations could be generated for surface treatment attributes.

TABLE 5

CERAMIC WARES

WARE (References)	38BK235	38BK236
INDETERMINATE	1122	
INDETERMINATE WOODLAND	97	254
STALLING'S (Williams 1968, Sears and Griffin 1950, Stoltman 1972)	10	
REFUGE (Williams 1968, Lepionka 1981)	8	2
THOM'S CREEK (Phelps 1968)	24	18
DEPTFORD (Sears and Griffin 1950, Williams 1968)	43	80
WILMINGTON (Caldwell 1952, Williams 1968)	29	33
CAPE FEAR (South 1960)	47	24
SAVANNAH (Caldwell and McCann 1941, Williams 1968)	17	
IRENE (Caldwell and Waring 1939)	22	2
YORK (South n.d.)	17	
INDETERMINATE MISSISSIPPIAN	267	
TOTAL	1703	413

The microscopic analysis emphasized paste characteristics. The sample of 96 body sherds was apportioned for the Middle-Late Woodland assemblage at 38BK236 (n=36); the Mississippian assemblage at 38BK235 (n=45); and the Woodland assemblage at 38BK235 (n=15). This sample was stratified further on the basis of frequency distributions and the correlations of different macroscopic attributes. Given the small sample size, any stratification that increased assemblage representativeness decreased the opportunity for significant comparisons. However, there were few studies that could be used to help identify culturally relevant attributes. As this analysis was an initial characterization of pastes from the Lower Coastal Plain of South Carolina, taking a number of observations across a wider range of sherd types appeared desirable. In this respect, the analysis is preliminary.

Surface treatment was primarily used to discover if certain attributes correlated with morphological and paste differences and to identify ceramic wares present at the sites (Table 5). Because of the regional variation within these wares, their utility is questionable. An in-depth formal analysis (see Muller 1973) was not attempted at this time, but such a study could help establish social and temporal distance through seriation studies (Marquardt 1978; see also Appendix A).

Distinguishing the temporal components in order to compare ceramic assemblages caused the greatest concern. The chronological problems encountered in the lower Santee River ceramic assemblages are discussed thoroughly by Anderson for the Mattassee Lake Project (Anderson 1982: 207-214). Ceramic sequences in use at the time of the analysis were formulated primarily for ceramic wares found at the mouth of the Savannah River and on the southeast coast of North Carolina (Table 5). For the most part, these wares do account for ceramic temporal variability at a general level (see also Anderson 1982: 211). Local types have been identified in the South Carolina Coastal Plain (Anderson 1975). The spatial and temporal variation even within local types is appreciable, and they have not yet been integrated or refined.

The Mattassee Lake personnel decided that existing typologies did not offer a fine enough chronological basis on which to sort their ceramic assemblage (Anderson 1982: 216). The Mattassee Lake ceramic analysis was directed towards establishing chronological controls using stratified deposits and refining the ceramic taxonomy using a type-variety system. These results were not available for use or comparison until after the Institute's functional ceramic analysis was completed.

In the absence of stratified deposits and radiocarbon dates and lacking a refined chronology, diagnostic surface treatments were used to identify the ceramic ware and assign a Woodland or Mississippian affiliation. Paste was not a significant sorting criteria; both assemblages were predominantly sand tempered (>95%). The multicomponent nature of the ceramic assemblage at 38BK235 was readily apparent. However, the Mississippian component represented at 38BK236 was extremely limited (see also Chapter 3). For purposes of comparison, then, all the analyzed ceramics from 38BK236, except the two Irene sherds, were assumed to be Middle-Late Woodland (n=411). The Mississippian assemblage at 38BK235 was isolated on the basis of burnished and complicated stamped surfaces, including a few incised and appliqued fragments (n=323). Plainwares, distinct from burnished sherds, were incorporated into the microscopic analysis of sherds from site 38BK235. They were distinguished on the basis of provenience, that is, their association with Mississippian or Woodland features.

The results of the Middle-Late Woodland and Mississippian assemblage comparisons that could be examined independently using the Mattassee Lake temporal/typological ceramic data were generally upheld (Anderson 1982: 225, 228-229). Where differences occurred, they appeared to be the result of 1) greater occurrence of earlier ceramic assemblages at the Mattassee Lake sites; 2) greater homogeneity of the ceramic assemblages at site 38BK235 and at site 38BK236; and 3) finer temporal/typological divisions in the Mattassee Lake ceramic analysis. Though the Mattassee Lake analysis did attempt to identify functional and temporal/typological correlations, functional impacts on spatial/temporal distributions have not been incorporated into the development of local and regional ceramic typologies. The implications for morphological and compositional differences in pottery distributions, especially in late prehistoric assemblages, argue against the use of a single, that is, temporal, dimension to account for ceramic variability. The contemporary existence of coarse and fine wares at Moundville is an example (Steponaitis 1980). At present surface treatment comprises the least functionally diagnostic data set. With further research, variation in surface treatment may also be seen to reflect functional and contextual, as well as temporal, differences.

Description and Analysis in the Macroscopic Study

All recognizable vessel fragment forms, i.e., lips, rims, necks, shoulders, bases, and body sherds equal to and greater than 3 cm in diameter were analyzed (Appendix B; Data Supplement VI). Variables selected and recorded for the morphological, compositional, and surface treatment data sets include the following:

Morphology	Paste	Surface Treatment
1. Rim diameter	1. Exterior color	1. Surface treatment
2. Curvature	2. Core color	2. Finish of exterior and interior surfaces
3. Thickness	3. Thickness	
4. Form of lip, rim, neck, shoulder, and base	4. Temper type	
	5. Temper size	
	6. Porosity	

The morphological variables relate to containment of vessel contents, capacity, stability, and/or durability. The vessel orifice, as measured by the rim diameter and influenced by the shape of the rim and neck, reflects the ease of access and degree of security (Braun 1980a). Capacity relates to vessel size or volume that is reflected in the curvature of the vessel wall. Stability relates directly to vessel shape, particularly its support or basal form, and size. Thickness relates to vessel shape, size, stability, and durability. It cross-cuts two data sets because of its correlation with both vessel size and temper size.

The vessel forms were coded according to profile (Appendix B). The rim profile data were ranked along a continuum from greatly everted to inverted (Fig. 27). The remaining variables were recorded using continuous data. Thickness, rim diameter, and curvature were measured to the nearest millimeter. Thickness was measured indirectly against widths on a standardized chart. The diameter of a rim is not easily measured: the orientation of the axis of the rim is critical, and a variety of curvature readings is possible for the same rim sherd depending upon how the observer holds the rim (DeBoer 1980: 133-135). To gain accuracy, only rim sherds 3 cm or more in length and measuring less than 100 cm in diameter (based on their curvature) were recorded.

The curvature of the body sherds was measured to provide a rough estimate of vessel capacity or volume. Using geometric attributes, Ericson and DeAtley (1976) and M.F. Smith (1979a, b) experimentally estimated vessel morphology and volume from sherds in modern ceramic assemblages. Applying similar techniques to these archeological assemblages involved measuring the sherd curvatures by tamping a carpenter's profile gauge against the inner wall of the vessel and then laying the profile gauge against a set of curves with known radii (Fig. 28). Although curvature measurements appear to be reliable on sherds greater than 3 cm in length (Marion Smith, personal communication), to save time, the curvature was calculated only for sherds equal to or greater than 5 cm. Curvatures exceeding a 50-mm radius were considered to be too flat to be reliable.

Two perpendicular measurements were taken to characterize these assemblages. Pots seldom conform perfectly to standard geometric shapes. If the slope of a vessel wall is known, the average measurements along the horizontal axis should present a more standardized measure for a pot (and assemblage) than the average measurement along the vertical axis where the curve is affected by the base and orifice. If the sherds could be oriented, for example, with reference to coil breaks, the horizontal curvature was recorded as such. But measurements of the horizontal curvature, again, give only a relative comparison of the surface area and volume. Without knowledge of the slope of the vessel wall, the average measurement falls between the maximum and minimum vessel diameters. A more ambitious and potentially rewarding study by M.F. Smith (1980a, b; 1981) uses computer assisted curvature measurements of sherds to reconstruct the slopes of vessel walls and vessel volume.

The measurements were used to approximate <u>relative</u> volume between the assemblages. Volume was calculated using the formula for a hemisphere ($2\pi r^3/3$). The relationship between this relative volume and functionally meaningful pot volumes has not been assessed for archeological assemblages. When M.F. Smith (1979a) averaged two perpendicular radii measurements on all pot sherds over 3 cm, his volume estimates based on this formula were within 59% of the <u>actual</u> values. (The radii estimates had a much smaller margin of error since the formula for volume inflated the error.) Although the predictive value of this figure may appear low, it is encouraging to think that the archeological estimates may even fall within this range.

Paste composition refers to the physical properties of the clay and clay matrix before and after firing. A number of measurable attributes,

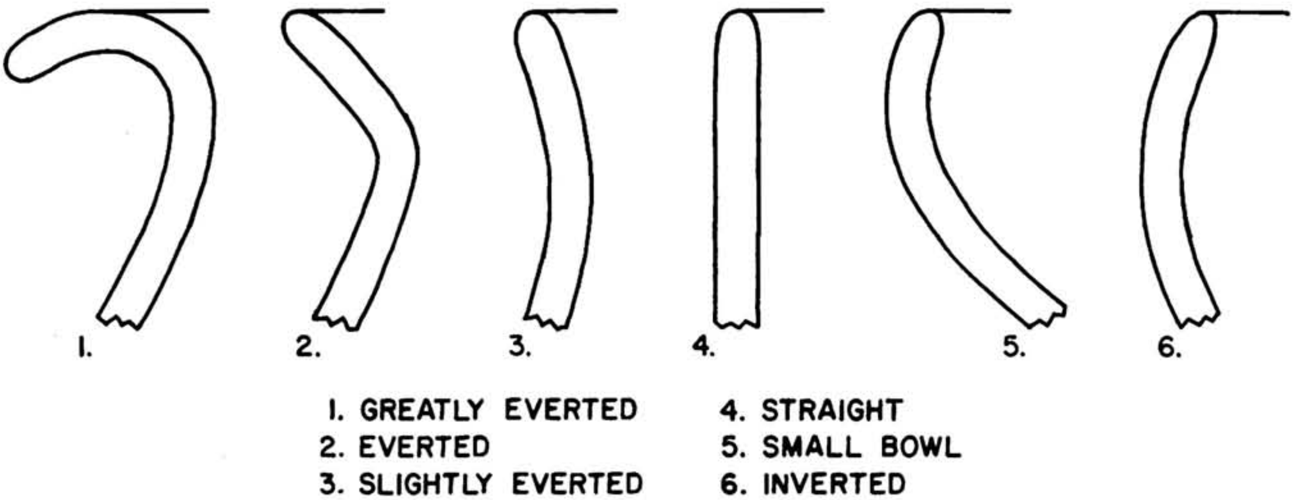


Figure 27. Coded ceramic rim forms (after Taylor and Smith 1978: 284).

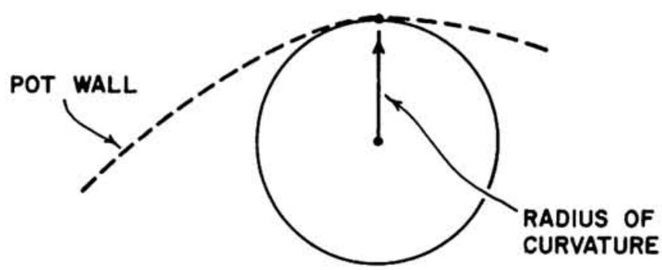


Figure 28. Measurement of vessel wall curvature (after M.F. Smith 1980b: 28).

used with the appropriate analytical techniques, can provide information about smoothness, strength, degree of porosity, firing temperature, the identity of nonplastic inclusions, etc. The macroscopic description of the variability in the paste was limited to observations on thickness (already discussed), temper, porosity, and color because the microscopic analysis was thought to characterize better the paste. Although hardness was initially considered, it was not measured since it, too, is a multidimensional property. The value of the measure depends on the analytical technique employed. With reference to the scratch test, which is dependent upon the porosity of the paste (Shepard 1968: 116), ceramic engineering tests to determine strength would be more profitable (e.g., Steponaitis 1980).

Natural inclusions and temper in the clay affect its texture, strength, and porosity. Temper is valuable also for identifying sources of raw material and intrusive pottery. Temper is usually added to improve the malleability of the clay. Crushed rock, shell, fiber, or grog may be used for tempering, and these categories comprised the temper types. Under a 6X scaled hand lens, the predominant size of these inclusions was ranked according to Wentworth's grain scale, from silt at less than 1/16 mm to granules greater than 2 mm (Shepard 1968: 118).

Inclusions may be natural occurrences or cultural additions--temper. One significant problem with pottery recovered from the Lower Coastal Plain of South Carolina is the distinction between temper and natural mineral inclusions because of the abundance of naturally occurring quartz in the clays. An untempered paste is not necessarily a finely textured paste. Residual clays may contain coarse, stable minerals from the parent material, and thus, may not require additional tempering (see Shepard 1968: 162). The petrographic analysis and X-ray diffraction were conducted, in part, to address this problem, although X-ray diffraction cannot by itself distinguish culturally added temper (Rice 1974).

Porosity, which is affected by firing and grain size, measures the volume of the pore space in the sherd (Shepard 1968: 125ff). As noted previously (p. 88), the higher the degree of porosity the higher the resistance to fluctuating temperatures experienced during firing and cooking. Porosity, which was determined for the 96 sherds selected for the microscopic analysis, was calculated by dividing the difference between the weight of the dry sherd and its saturated weight by the volume of the sherd as measured by displacement in cubic centimeters (Shepard 1968: 127). Full saturation was achieved by allowing the sherds to soak in water overnight.

The primary causes of color variability are the raw clay materials used and the firing conditions, e.g., evidence of incomplete oxidation due to low firing temperature or variable ventilation caused by firing on top of the ground. The core and exterior surface of each sherd was color coded based on the values of the Munsell color system (Shepard 1968: 109; Appendix B).

The final data set involved surface treatment variables. Evidence of hand or tool finishing techniques was considered primarily for the interior of the vessel, but similar observations were also recorded for the exterior. The principal observations were the impressions or additions made on the plastic exterior surface of the vessel. The data categories included fabric impressed; simple, checked, and complicated stamped; incised; appliqued; etc. (Appendix B). Although subdivisions of the various types of stamping or impressions were made, the elements were not recorded in detail. That is, grid size or width was not recorded for check stamping, Z-twists or S-twists for cord marking, or depth of grooves for incising or stamping.

In addition to these three data sets, comments concerning manufacturing techniques and use/wear were recorded for individual sherds. The presence or absence of coil breaks was noted, especially in reference to the horizontal curvature measurement. Other observations considered were post-fired burning or smudging, charred exteriors, interior residue, staining, mending holes, suspension holes, and spalling.

Middle-Late Woodland Assemblage

The characterization of the Middle-Late Woodland assemblage is based on the sherds recovered from 38BK236 (Fig. 29). The sample size was small, 411 sherds: 57 rims, 3 shoulders; 3 bases; 137 large body sherds; and 211 medium body sherds (Data Supplement VI). In addition to general frequencies, a series of two-way and three-way cross tabulations was run on the data using the SPSS package (Nie et al. 1975). Since the sample size was so small, expected cell frequencies in almost every case were less than five, thus invalidating any statistical reliability. However, several interesting trends were noted. These possible associations are presented as working hypotheses that can be tested as new data sets increase the sample size. Future consideration should be given to comparing these sherds with Woodland assemblages from 38BK235 and other sites in the project area and surrounding environs.

Attention was first directed toward morphological variability in vessel size and shape. Sherd size and configuration did not always allow curvature measurements in two, perpendicular directions. Thus, two sets of curvature measurements or diameters were calculated and compared (Fig. 30a, b). The average curvature, which was the averaged curvature of the two perpendicular measurements, is approximately equal to the mean for all the curvature measurements combined. While obscuring the range of variability, a composite vessel configuration was formulated for comparison with the Mississippian assemblage. The assemblage composite vessel measures 35 cm in diameter and has a volume estimated at 11 liters based on the formula ($2\pi r^3/3$).

Of the 50 identifiable rim profiles, over half were straight rims: 3 everted; 10 slightly everted; 32 straight; 5 small bowls. Only 16 rim diameters could be measured reliably (Fig. 31, Table 6). Although the small bowl profiles have the higher diameters, this measure could reflect shallow, wide-mouth bowls for serving, in contrast to the others, which fit the expected generalized, multifunctional vessels.

A larger percentage (45%) of the analyzed sherds had identifiable coil breaks. A horizontal curvature was calculated from these data in order to compare the rim area with the horizontal curvature area (Figs. 30c, 31). The area ratio in centimeters is 1:1.1. Although the rim diameter need not

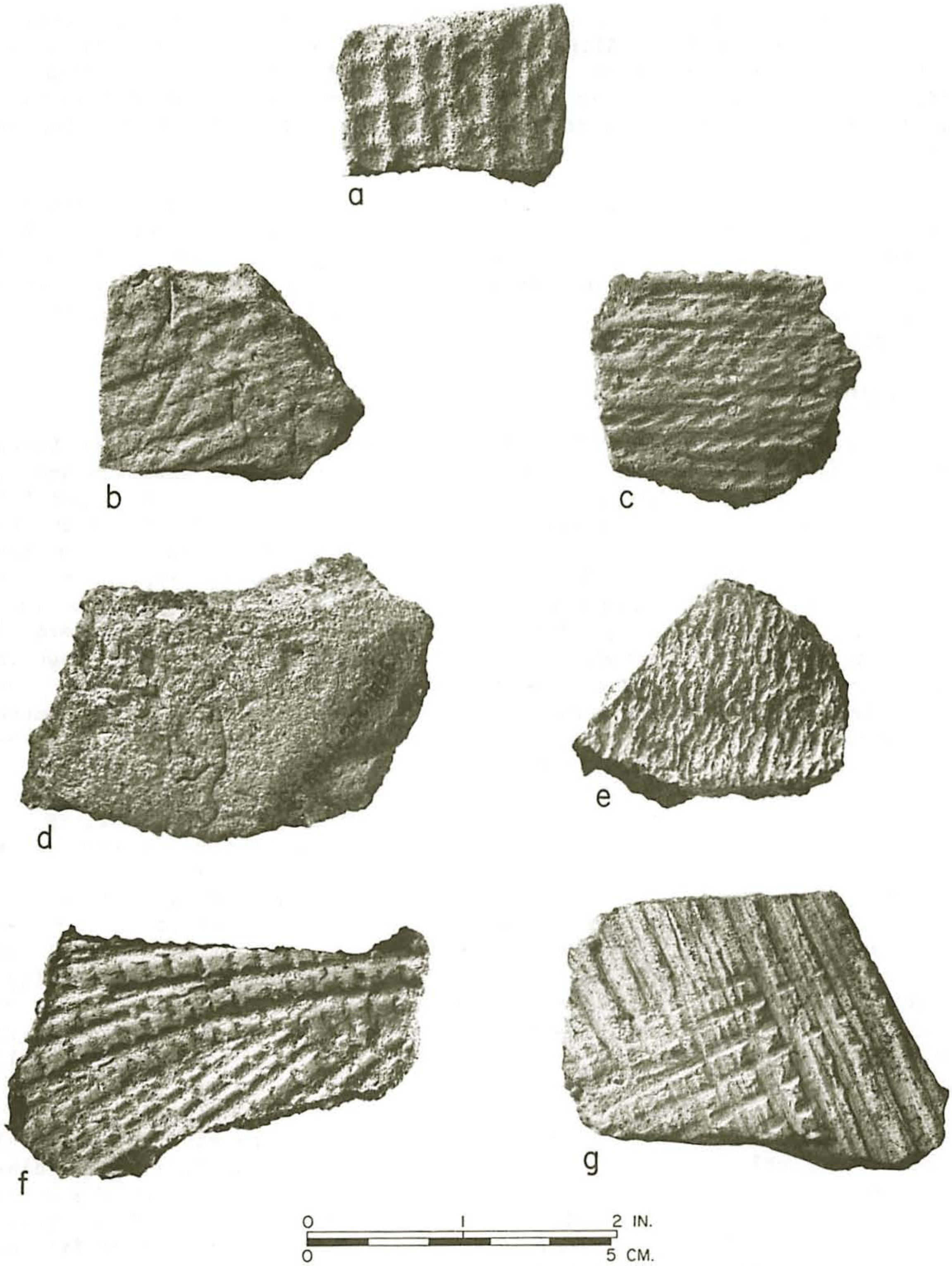


Figure 29.* Pottery from Site 38BK236: a) check stamped; b) simple stamped; c) cord marked; d) plain; e) fabric; f) linear check stamped; g) simple stamped.

*Examples are comparative specimens from the microscopic analysis.

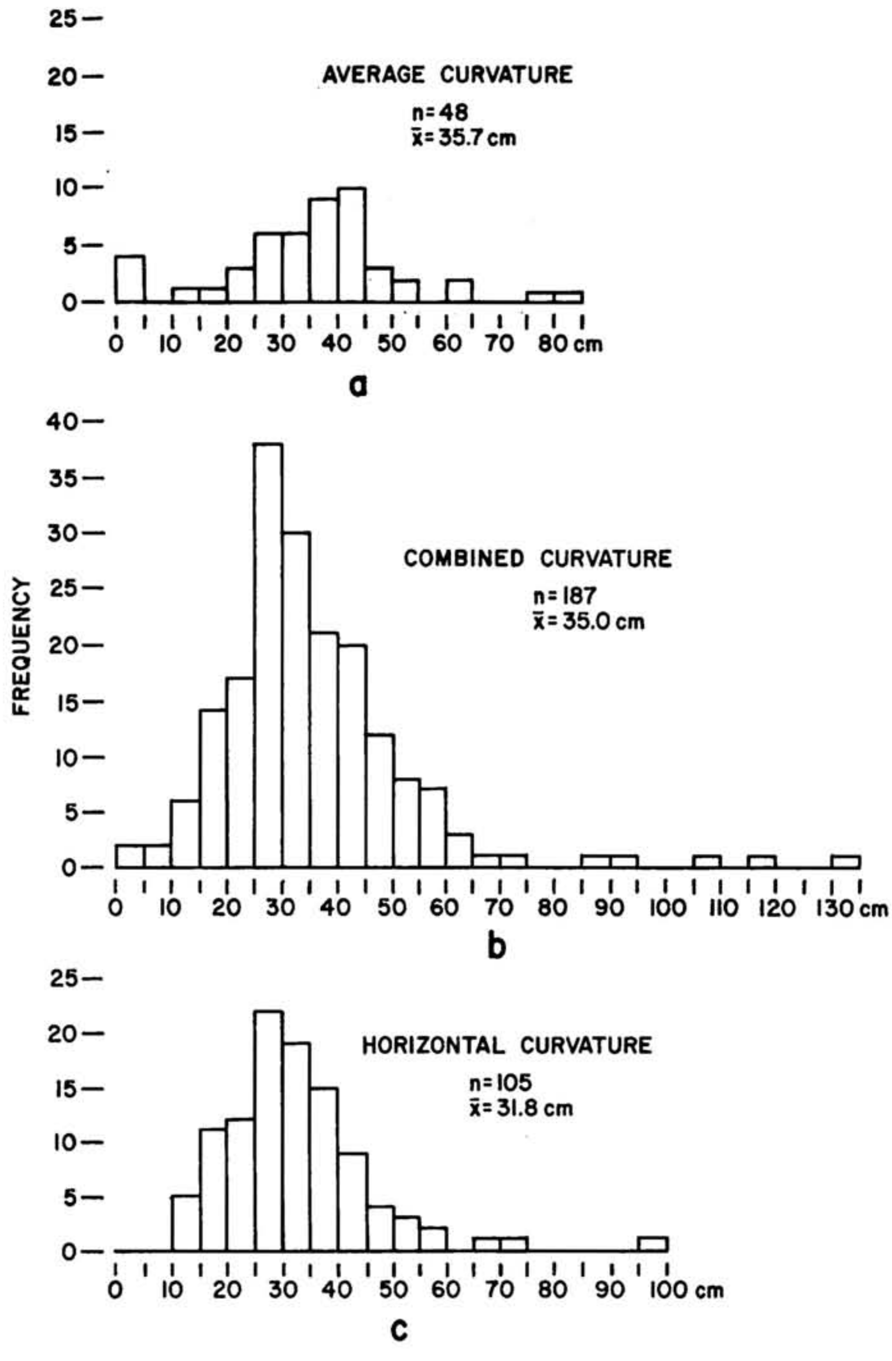


Figure 30. Middle-Late Woodland assemblage curvature.

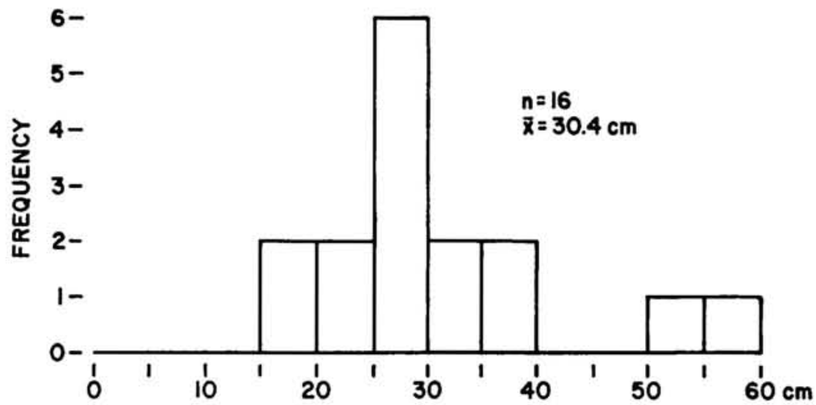


Figure 31. Middle-Late Woodland rim diameters.

Figure 32. Middle-Late Woodland schematic vessel profiles. (See text.)

TABLE 6

DISTRIBUTION OF DIAMETERS BY RIM PROFILE

Rim Profile	Diameter range (cm)	Frequency
Straight	15-29	8
	55-59	1
Slightly Everted	25-39	5
Small Bowl	35-39	1
	50-54	1
Total		16

correspond to vessel orifice, in this case half of the measurable rims are straight, suggesting ready access (Fig. 32).

The average thickness of the vessels is 7.4 mm (Fig. 33). A thickness of 6 mm exhibited the greatest range of curvatures, 10 cm through 59 cm and one at 96 cm. While thickness and size showed no unexpected patterns, unexpected differences occurred when thickness was compared to surface treatment (Table 7; Fig. 34a, b).

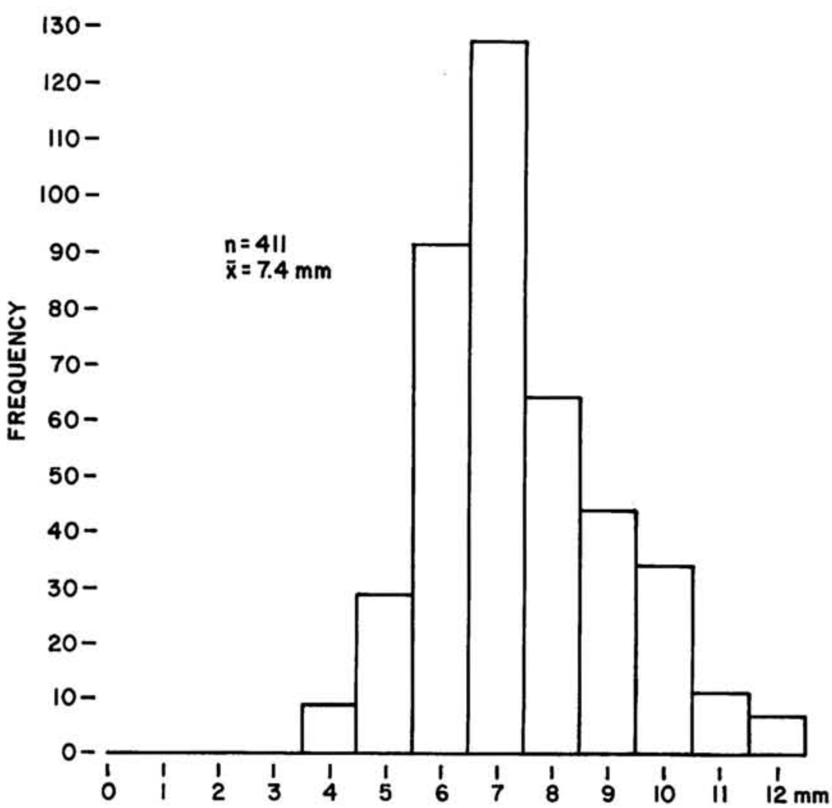


Figure 33. Middle-Late Woodland thickness.

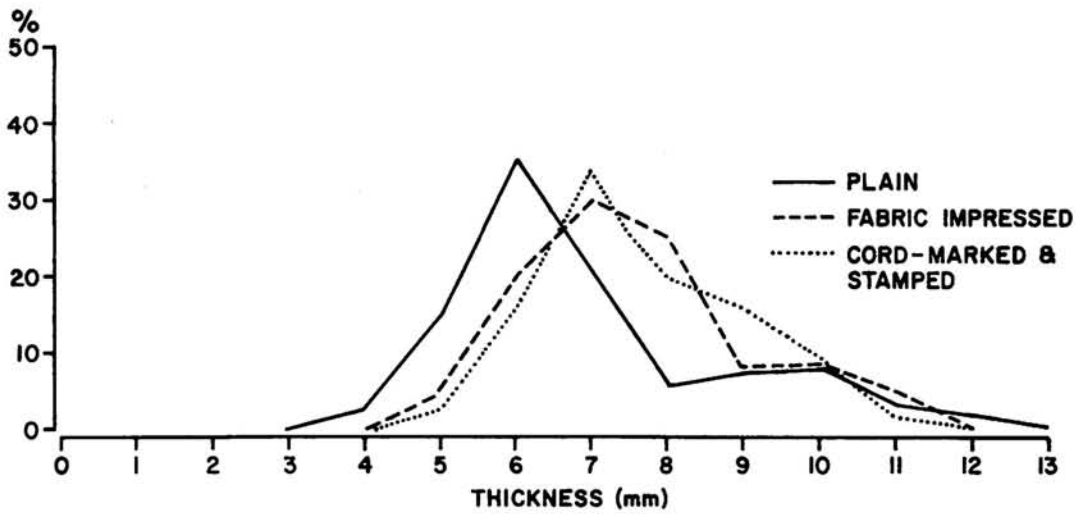
TABLE 7

DISTRIBUTION OF THICKNESS OF SURFACE TREATMENT
MIDDLE-LATE WOODLAND

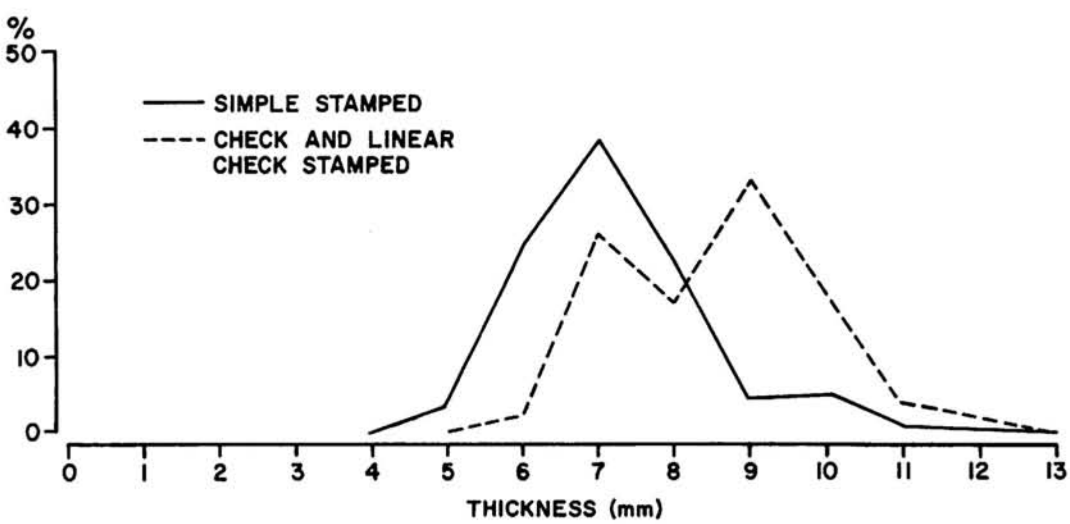
Thickness (mm)	Plain	Fabric Impressed	Cord Marked	Simple Stamped	Check Stamped	Linear Check Stamped
4	3	0	0	0	0	0
5	18	2	1	4	0	0
6	44	8	3	27	0	2
7	27	12	9	40	9	11
8	7	10	2	24	9	5
9	8	2	0	5	9	18
10	10	3	0	5	4	10
11	4	2	0	1	2	1
12	3	0	0	0	0	2
	-----	-----	-----	-----	-----	-----
	124	39	15	106	33	49

If surface treatment is related to manufacturing techniques (see p. 90), then differences in types of finishing techniques to bond the clay should correspond to thickness: welding the clay in thicker vessels should require technological assistance to produce durable, strong pots. Finishing techniques were divided into three types: (1) smoothed (plain); (2) fabric impressed, which may be the result of wrapping the vessel for support (Holmes 1903: 71); (3) paddled (wrapped and carved paddling includes cord marking, simple stamping, and check and linear check stamping (Fig. 34a). Plainwares may be distinguished from the other two. To determine whether thickness differences occurred between carved paddles, simple stamped and check and linear check stamped were compared (Fig. 34b); the latter exhibits a bimodal distribution and greater thickness. Cross simple stamped is not distinguished from simple stamped since both elements occurred on the same partially reconstructed vessel fragments in the assemblage at 38BK236; a number of check stamped were also linear check stamped, so no distinction is made between them.

Half, or 53%, of the sand tempered pottery (quartz = 98%) contains very coarse sand grains between 1 and 2 mm. This very coarse sand tempering is associated with the 6 and 7 mm thickness in 31% of the sherds. Like thickness, large temper sizes do not always occur with large horizontal curvature measurements (Data Supplement VI). The distribution of grain size between plainwares and paddle stamped pottery is approximately the same (Data Supplement VI). However, the simple stamped pottery do show a slightly higher proportion (24%) of fine- and medium-sized grains than the check and linear check stamped sherds (20%) or plainwares (15%) in the very



a.



b.

Figure 34. Distribution of thickness by surface.

fine to medium range. Most of the fabric impressed sherds contain granule-sized temper (25, n=39) and account for half of the granule-sized tempered sherds in the assemblage.

Over three-quarters of the observed exterior colors were brown. Black cores were recorded in a number of cases, 53 or 25% of the time, where the core color could be determined. Almost 90% of these cases had brown exteriors and therefore might indicate incomplete oxidation because of the low-firing temperatures (see p. 100). Comparing the black cores to temper size and thickness shows that 50% of these are associated with sherds which are 7 and 8 mm thick and have grain sizes ranging from very fine to granular. Whether the larger temper size and thickness indicate that the pottery was not completely oxidized is questionable. However, one-third of the sherds displays very coarse temper at thicknesses of 9 and 10 mm.

Black cores are found associated with all the well-represented types of surface treatment. The core color of the plainwares grades evenly from black through gray to brown, as does the core color of the fabric impressed sherds (Data Supplement VI). Of the stamped wares, the check and linear check stamped sherds exhibit approximately equal distribution between the black and brown cores. The simple stamped sherds have almost no black cores.

The porosity tests for the Woodland assemblages at both 38BK235 and 38BK236 produced very low values, under 10% (Table 8). No significant differences occur among the various surface treatments. The low porosity suggests that the pottery was completely oxidized, perhaps by hot, sustained firing, as recorded in the ethnographic accounts (see p. 91).

Summary

The number of vessels represented by the sample from 38BK236 is small. Based on data from the rim sherds, the minimum number of vessels represented is 10 (Table 9). This number agrees with the partial sorting and reconstruction of between 6 and 8 vessels and with the subjective estimates of vessel number (minimum = 15/maximum = 25) during the analysis. Although the three linear check stamped rim sherds may all be from the same vessel, at least three distinct linear check stamped vessels were recognized during the course of the analysis. In addition, the two sherds of Vessel #7 had the same 30.6 cm diameter.

A three-way cross tabulation of horizontal curvature by thickness by surface treatment was run to help illustrate the range of variability in the assemblage. These data were matched with surface treatment of vessel numbers 1 through 10, and area ratios were then calculated (Table 9). These composite vessels are not meant as reconstructions of functional reality. They are offered as relative or comparative measures of functional variability.

In this analysis, differences in surface treatment are recognized relative to thickness. The carved paddle stamped pottery is slightly thicker and the mean of the horizontal curvatures is also slightly higher than for the plainwares; i.e., the mode for the plainwares is 25-29 cm, for

TABLE 8

POROSITY PERCENTAGE OF WOODLAND ASSEMBLAGES

Site	Plain	Fabric Impressed	Cord-Marked	Simple Stamped	Check Stamped	Linear Check Stamped	Dentate	Incised
38BK235	5.7	6.3		5.1		7.8	5.1	5.0
	3.4	4.9		4.1				
	3.9			5.0				
	6.1			10.7				
	3.5							
	5.1							
	2.1							
38BK236	8.8	7.4	6.1	6.1	7.4	4.1		
	6.3	10.3		4.4	5.0	5.4		
	5.9	6.7		7.4	4.5	4.5		
	3.8	5.8		6.5	3.7	5.1		
	8.0	7.2		7.1		3.9		
	4.4	7.3		4.1		6.5		
	5.4	5.1		6.8				
	6.6			4.0				
	7.0							
	5.0							
Subtotal				n = 12 $\bar{x}$ = 5.9	n = 11 $\bar{x}$ = 5.3			
				[t = 1.214, df = 21, p > .2]				
Subtotal	n = 17 $\bar{x}$ = 5.4				n = 35 $\bar{x}$ = 5.6			
		[t = 1.098, df = 50, P > .2]						
TOTAL				n = 52 $\bar{x}$ = 5.5				

TABLE 9

MIDDLE-LATE WOODLAND ASSEMBLAGE MINIMUM VESSEL NUMBER

			RIM		HORIZONTAL CURVATURE			
VESSEL	SURFACE TREATMENT	PROFILE	DIAMETER RANGE (CM)	NUMBER	DIAMETER RANGE (CM)	NUMBER IN RANGE	THICKNESS (MM)	AREA RATIO
1	Plain	Straight	55-59	1	15-39	15 n=22	6.3	1: .1
2	Fabric Impressed	Straight	20-24	2	20-29	5 n=9	7.2	1:1.2
3	Simple Stamped	Straight	25-29	3	20-44	23 n=31	7.1	1:1.6
4	Check Stamped	Straight	15-20	1	10-44	5 n=5	9.6	1:2.5
5	Dentate	Straight	25-29	1	-	-	-	-
6	Plain	Slightly Everted	25-29	2	15-39	15 n=22	6.3	1:1
7	Linear Check Stamped	Slightly Everted	30-34	2	20-39	22 n=27	8.7	1: .85
8	Linear Check Stamped	Slightly Everted	35-39	1	20-39	22 n=27	8.7	1: .6
9	Cord-marked	Small Bowl	35-39	1	15-25	3 n=4	7.0	1: .3
10	Simple Stamped	Small Bowl	50-54	1	20-44	23 n=31	7.1	1: .4

linear check stamped, 30-34 cm, with simple stamped falling between the two (Data Supplement VI). These differences cannot be related further to morphological or paste characteristics that have functional implications.

Surface treatment seems to distribute randomly in the main block of the excavation at 38BK236. A series of CALFORM maps (White and Sexton 1980) that show the distribution of the different surface treatments was prepared for Feature 1, or the main block (Data Supplement VI). Simple stamping occurred throughout the main block whereas the check and linear check stamped and fabric impressed sherds were concentrated in the eastern extension and southeastern corner of the block (see Figs. 35, 36 for examples). Plainwares were more heavily represented in the southern half of the block, as well.

To summarize, a composite of the total ceramic vessels analyzed at 38BK236 would be a 7.4 mm thick, brown, very coarsely sand tempered vessel. It would be either simple stamped or plain, having a volume of about 11 liters, a slightly restricted opening relative to vessel circumference (1:1.1) and a moderate to low orifice-to-volume ratio.

The Mississippian Assemblage

The characterization of the Mississippian assemblage is based on a sample of 323 sherds from 38BK235. This sample represents 19% of the analyzed sherds from this multicomponent site (Fig. 37). In order to isolate the Mississippian assemblage, a sample was selected on the basis of surface treatments found in traditional Mississippian assemblages (see p. 97). Burnished plainwares accounted for 56% of the sample; rectilinear and complicated stamped surface treatments, 34%. The remaining 10% were incised, punctated, cob impressed, or had appliqued fillets. The Mississippian assemblage contained 52 rims, 13 necks, 2 shoulders, 1 base, 77 large body sherds, and 170 medium body sherds. Frequency and cross-tabulations were calculated for the morphological, compositional, and surface treatment variables. As in the case of the Middle-Late Woodland assemblage, the sample size was too small to permit statistical inference (Fig. 38). Nonetheless, interesting associations between the variables are offered as working hypotheses, to be tested in future analyses.

Because the assemblage is composed primarily of two major categories of surface treatment, much of the morphological and compositional variability could be attributed to their interaction. This was apparent from the beginning when the histograms were prepared for the averaged, combined, and horizontal curvatures (Fig. 39). The horizontal curvature suggested the possibility of a bimodal distribution. When the horizontal curvatures were calculated for the burnished plainwares and complicated stamped sherds, the complicated stamped vessel curvatures were larger (Fig. 40).

The difference between the averaged and combined curvature results is greater than for the Middle-Late Woodland assemblage. As the total number of measurements did not appear to be heavily biased, the combined curvature with the larger sample size was selected to characterize the composite vessel for the assemblage: 39 cm diameter and 15 liter capacity. Composite vessel forms were also calculated for the burnished plainwares and the complicated stamped vessels:

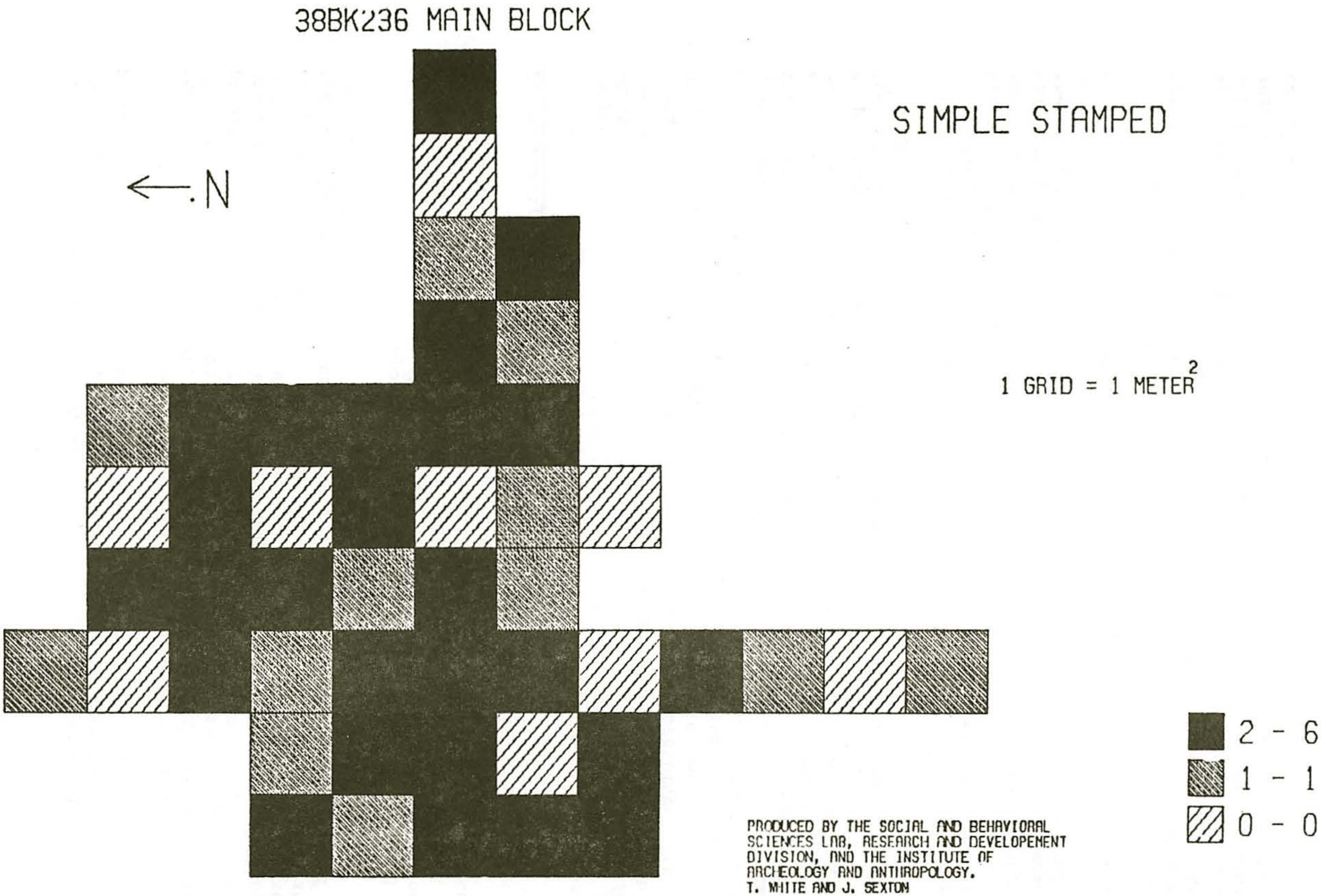


Figure 35. Calform map showing the distribution of simple stamped sherds.

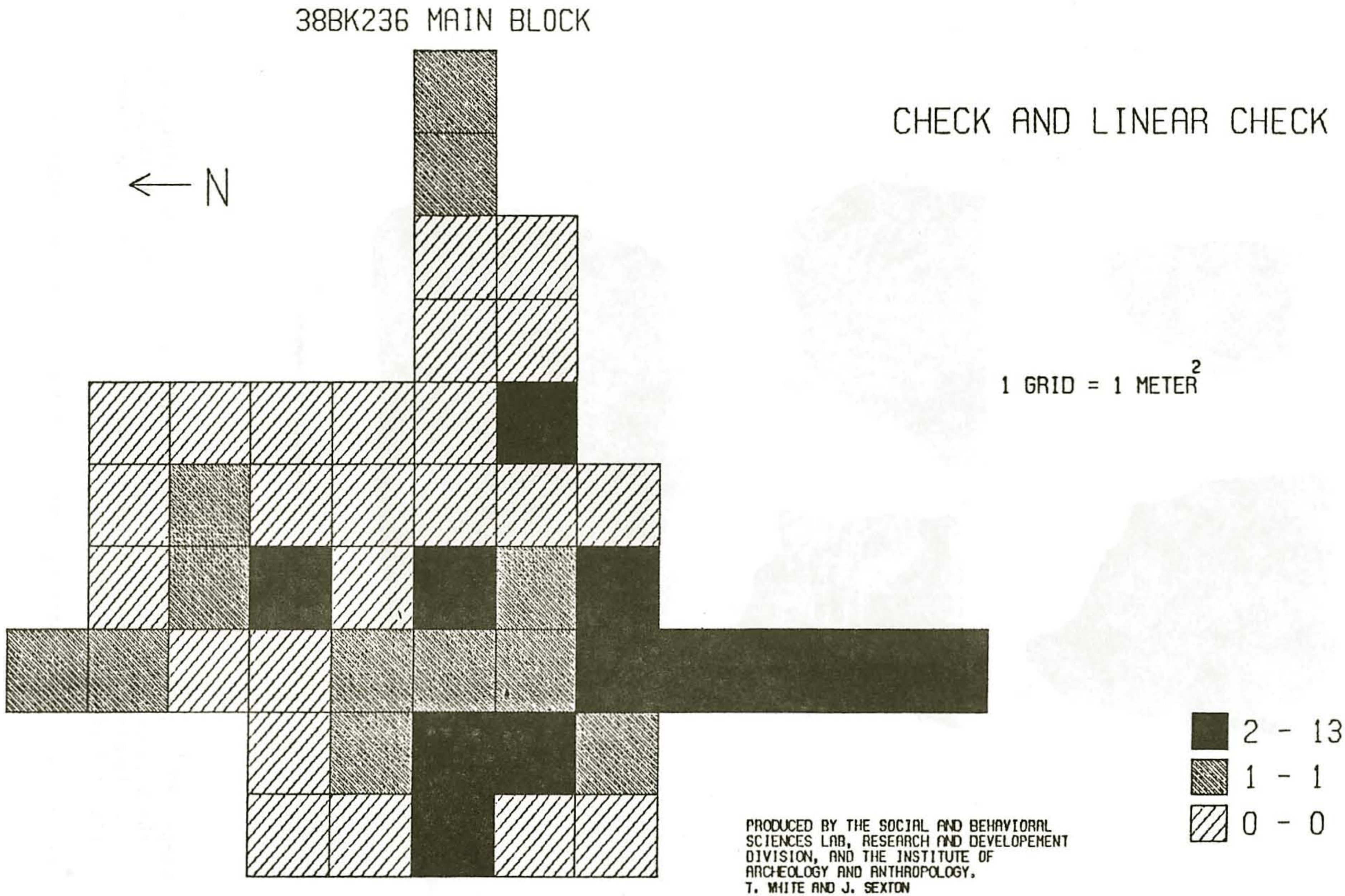


Figure 36. Calform map showing the distribution of check and linear check stamped sherds.

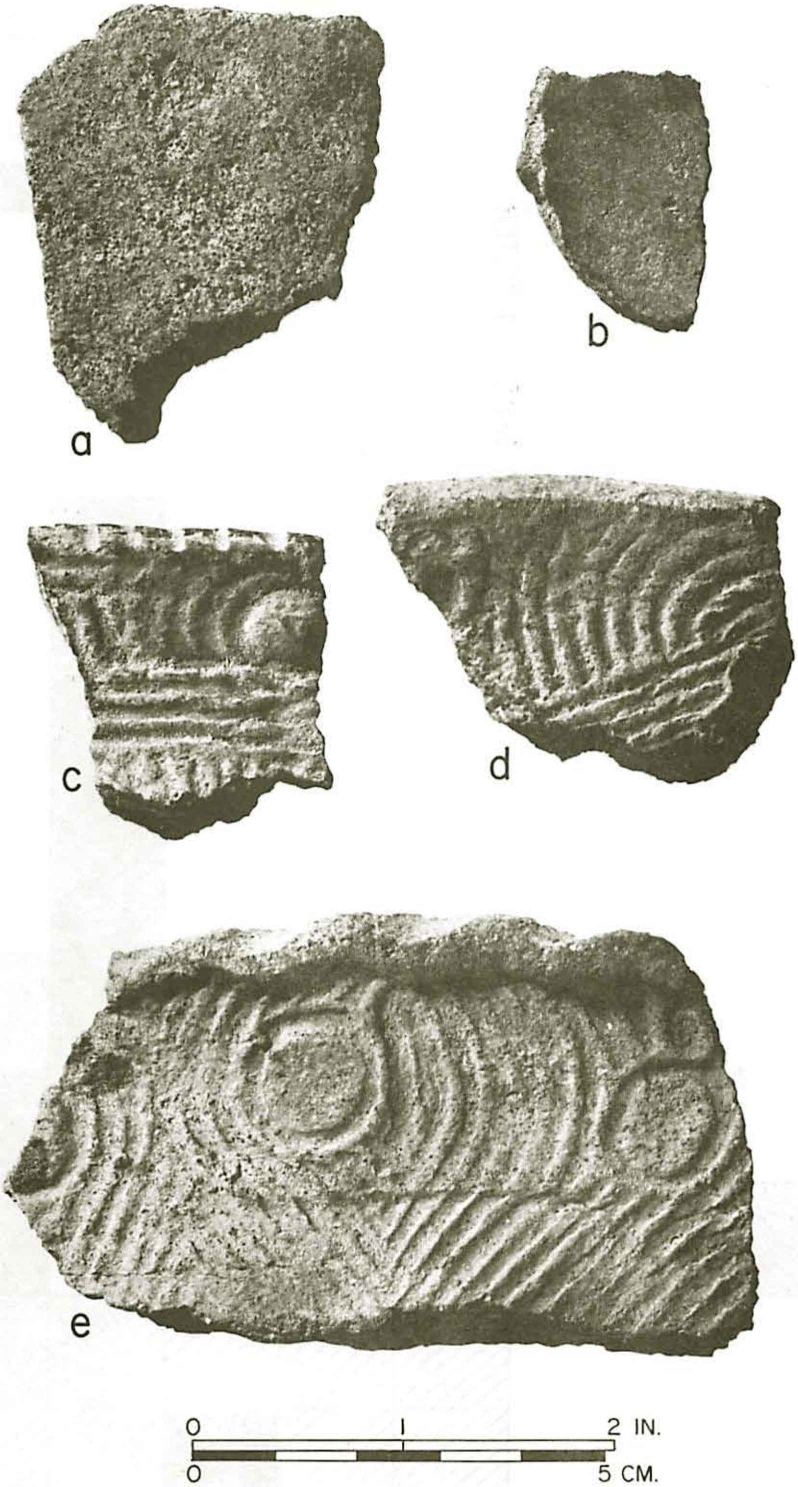


Figure 37.* Mississippian pottery: a) plain, b) burnished plain, c) curvilinear complicated stamped, incised lip (everted rim), d) curvilinear complicated stamped (everted rim), e) curvilinear complicated stamped (everted rim).

*Examples are comparative specimens from the microscopic analysis.

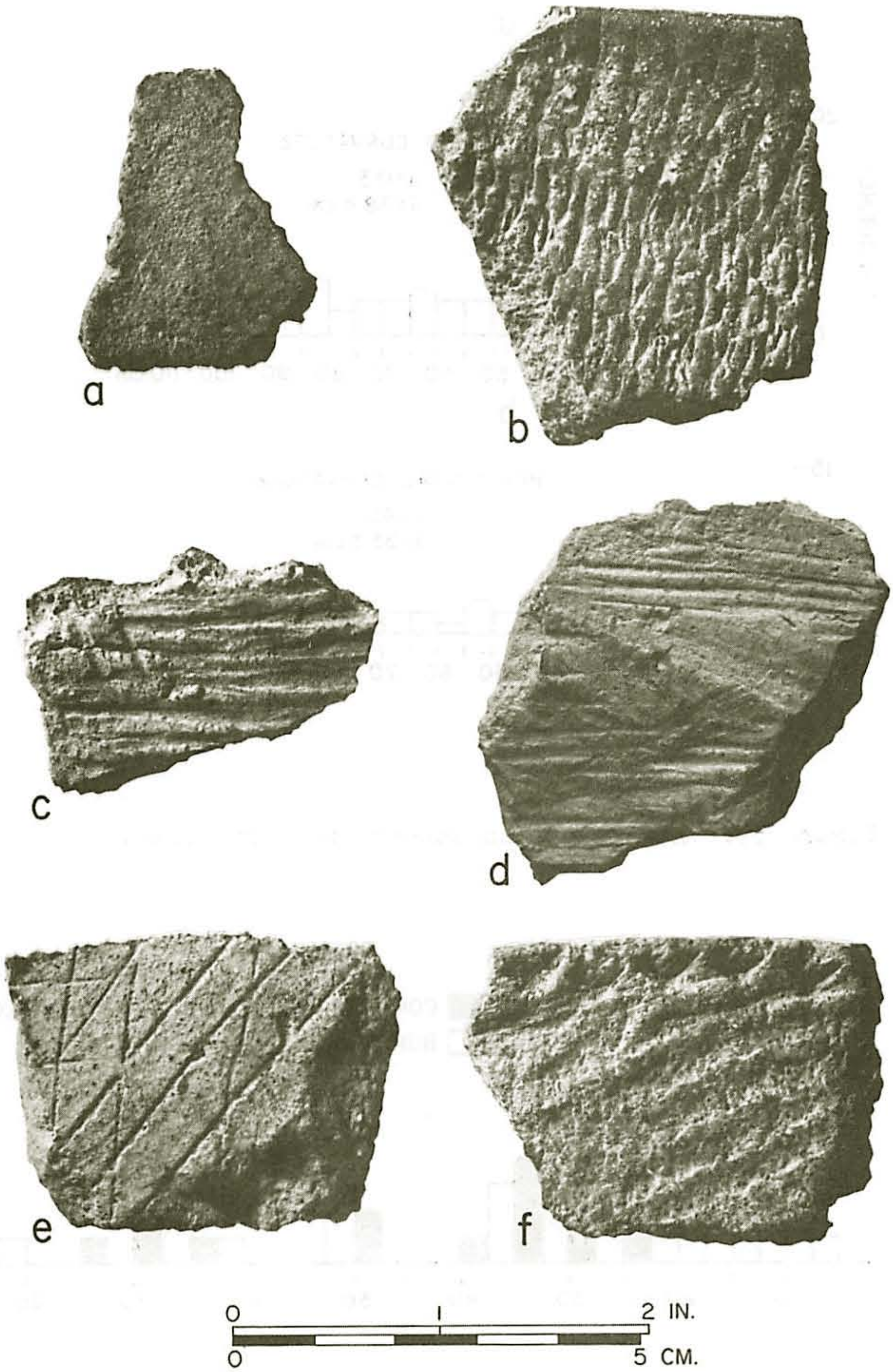


Figure 38.* Non-Mississippian pottery: a) plain, slightly incised, b) fabric, incising on rim edge (everted rim), c) simple stamped, d) (cross) simple stamped, e) incised, f) linear check stamped with punctate rim (straight rim).

*Examples are comparative specimens from the microscopic analysis.

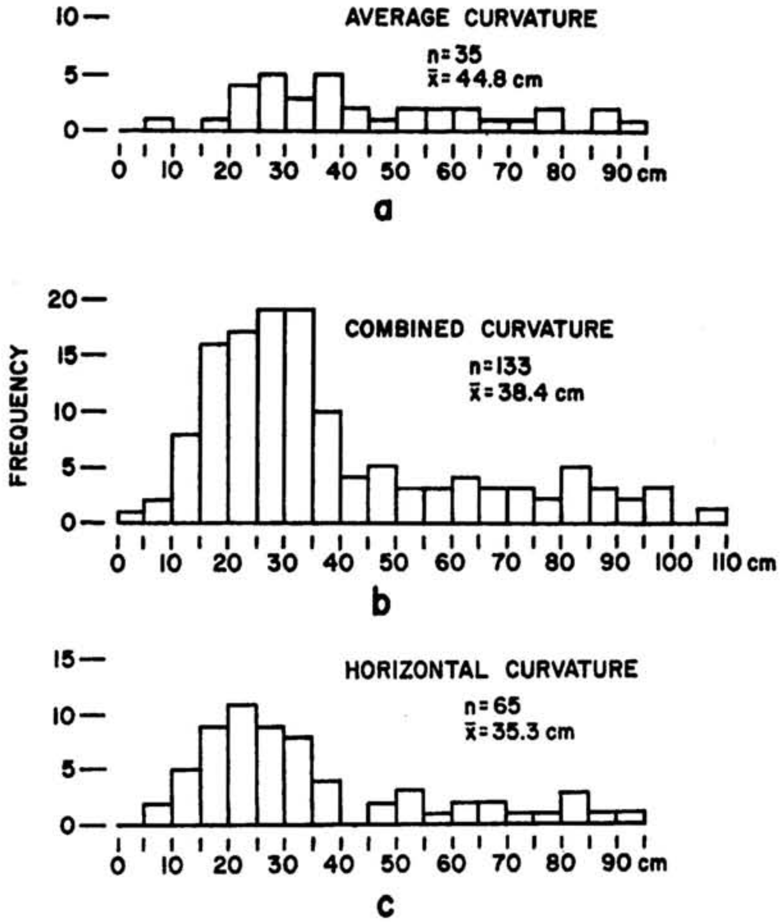


Figure 39. Mississippian assemblage curvatures.

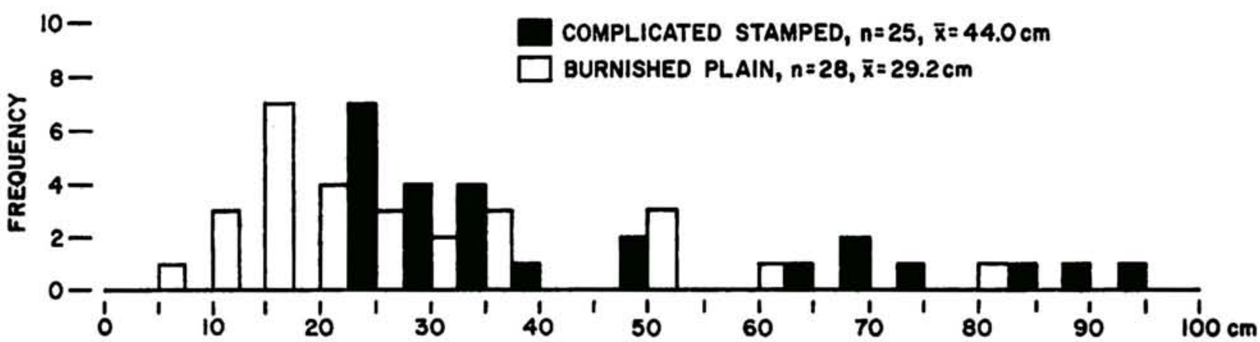


Figure 40. Horizontal curvature for complicated stamped and burnished plain wares.

	Burnished Plain	Complicated Stamped
Average Curvature	n = 18 38.7 cm 15.1 liters	n = 12 56.9 cm 48.4 liters
Combined Curvature	n = 70 34.5 cm 10.7 liters	n = 44 47.1 cm 27.3 liters

Complicated stamped vessels appear to be three times larger than burnished plainwares.

Rim profiles could be determined for 48 of the 52 rims: 1 greatly everted; 8 everted; 19 slightly everted; 16 straight; 2 small bowls; and 2 inverted. Diameters were measured on 28 rims (Fig. 41a; Table 10: rim profiles were indeterminate for 5 diameters). The rim diameters for the entire assemblage at 38BK235 are higher than at 38BK236. At 80 and 90 cm,

TABLE 10

MISSISSIPPIAN ASSEMBLAGE,
DISTRIBUTION OF DIAMETERS BY RIM PROFILE

Rim Profile	Diameter Range (cm)	Frequency
Everted	10-19	3
	30-39	2
	55-59	1
	70-74	1
	80-84	1
Slightly Everted	25-29	2
	40-44	1
	85-94	3
Straight	15-24	2
	30-34	1
	45-49	2
	75-89	3
Small Bowl	30-34	1
TOTAL		23

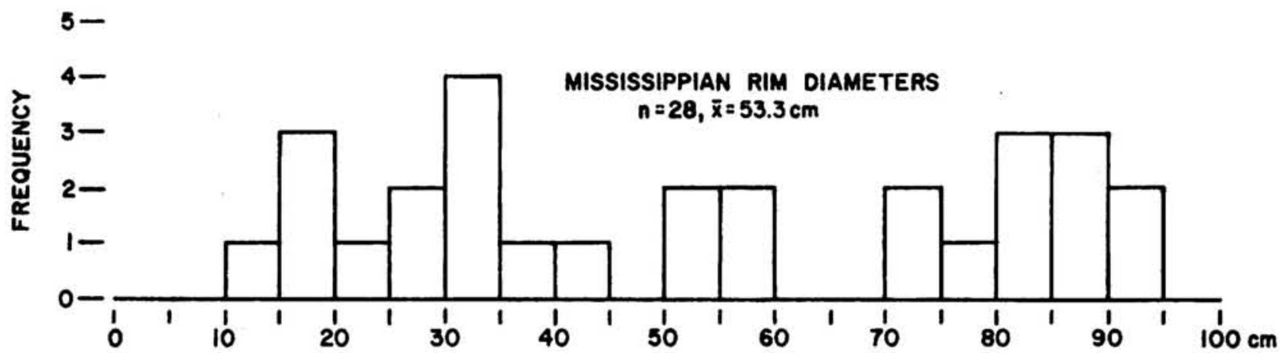


Figure 41a. Horizontal curvatures for rims.

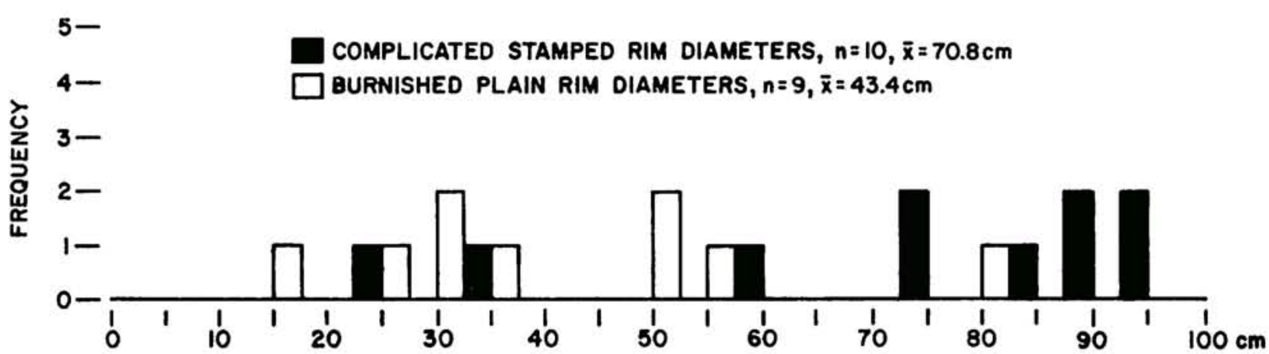


Figure 41b. Horizontal curvatures for rim diameters.

the curvatures for these diameters were almost at the extreme end of reliable measurements, even though only rims 3 cm or more in length were measured. For the entire assemblage at 38BK235, 46 rims measured over 50 cm, 28 over 70 cm. One-third of these were accounted for by the Mississippian assemblage. Of the 11 Mississippian rims over 70 cm in diameter, 7 were complicated stamped (Fig. 41b). Thus, the higher diameters appear to be meaningful in terms of surface treatment, supporting the size differences already noted between the Mississippian burnished plainwares and the complicated stamped pottery.

The rim-to-horizontal curvature area ratio for the composite vessel is 1: .44 (Fig. 42; Note: the percentage of identifiable coil breaks in the Mississippian assemblage is 39%). The ratios for the complicated stamped vessels and the burnished plainwares are 1: .32 and 1: .45, respectively. The high percentage of everted and slightly everted rims and the area ratios suggest a high orifice-to-volume ratio. Although the composite figures are not intended to mirror reality, a curvilinear complicated stamped vessel with a profile similar to the schematic drawing is illustrated by Holmes (1903: Plate CXV a).

The average thickness of the Mississippian pottery is 7.1 mm (Fig. 43). The burnished plainwares average 7.0 mm; complicated stamped is slightly thicker at 7.5 mm. Their distributions are graphed in Figure 44. The rectilinear complicated stamped pottery is affecting the pronounced peak in the stamped pottery at 8 mm (Fig. 44).

The pottery is primarily sand tempered (98%), with three major temper sizes: medium, 1/4 to 1/2 mm; coarse 1/2 to 1 mm; and very coarse, 1 to 2 mm. All three categories are evenly represented at around 30%. No unexpected patterning occurs between thickness and temper size, nor is there a direct relationship with horizontal curvature, i.e., greater thickness, larger temper size, and higher diameters do not correspond (Data Supplement VI).

Although there is no apparent difference in the distribution of temper size between burnished plainwares and complicated stamped pottery, when the curvilinear and rectilinear patterns are separated, the rectilinear has a higher proportion of very coarse temper (51%) whereas the curvilinear has a higher proportion of medium (46%). The medium-sized grains in the curvilinear sherds distribute evenly over the thickness range, but the very coarse grain size of the rectilinear sherds corresponds to thicknesses of 7 and 8 mm (Fig. 44).

The pottery is primarily brown (67%), with black cores occurring 25% of the time where core colors are distinguishable (Data Supplement VI). There are no apparent relationships among core color, temper size, and thickness. However, of the 33 black cores, 67% are burnished plainwares. Burnished wares require lower firing temperatures in order to retain their polish and may, thus, exhibit soft cores (Shepard 1968: 124). However, the porosity values are all under ca. 10% (Table 11), which suggest complete oxidation in most cases (see Shepard 1968: 223). In fact, the porosity readings of the burnished plainwares are lower than those of the complicated stamped pottery. (Note: Plainwares were added only for the micro-

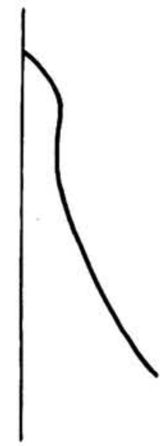


Figure 42: Mississippian schematic vessel profile.

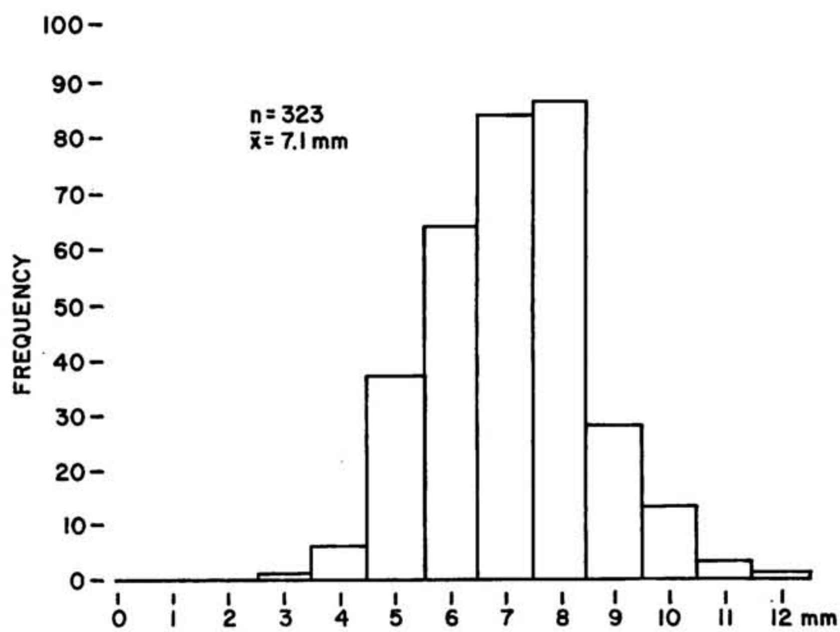
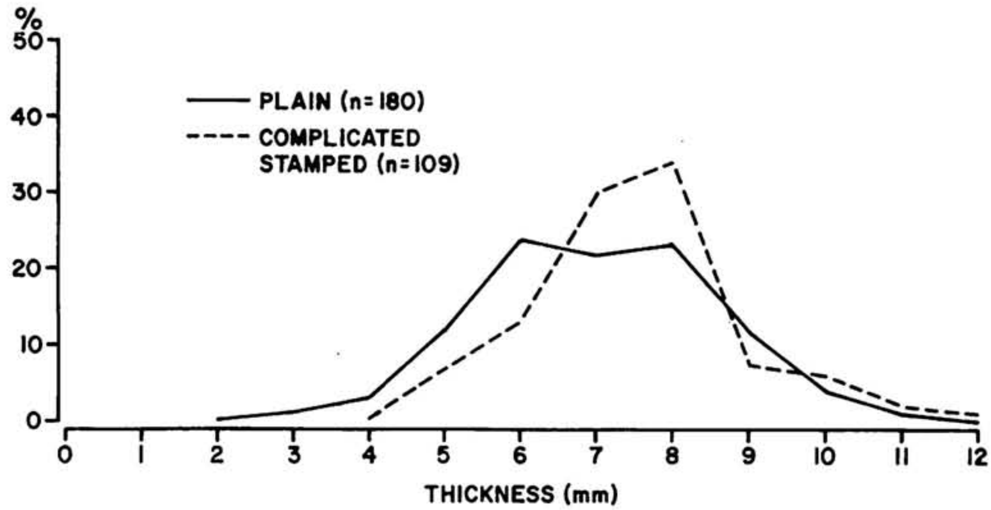
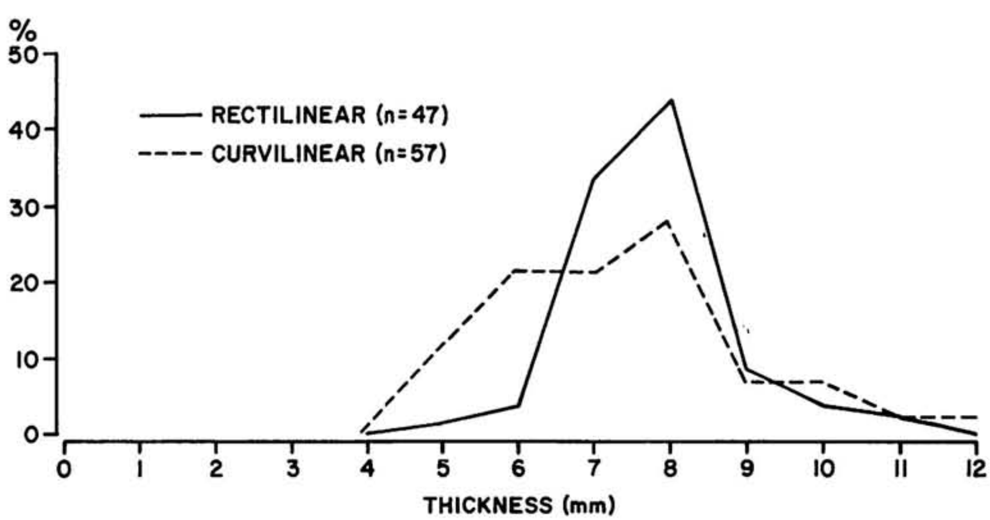


Figure 43: Mississippian assemblage thickness.



a.



b.

Figure 44: Distribution of thickness by surface treatment - Mississippian.

TABLE 11

POROSITY PERCENTAGE OF MISSISSIPPIAN ASSEMBLAGE

Site	Plain	Burnished	Complicated Stamped
38BK235	5.6	6.5	7.2
	6.7	6.4	7.7
	3.4	0	5.1
	5.4	5.5	7.2
	8.8	4.1	6.5
	5.5	4.2	7.5
	5.2	11.7	7.2
	12.5	3.6	2.4
	4.6	4.2	8.0
	5.8	5.8	3.1
	4.6		4.3
	7.8		7.2
	6.8		7.6
	2.8		8.3
	7.2		
Subtotal		n = 10 x = 5.2	n = 14 x = 6.4
		[t = 1.217, df = 22, P > .2]	
Subtotal	n = 15 x = 6.2	n = 24 x = 5.8	
	[t = .382, df = 37, P > .5]		
TOTAL		n = 39 x = 6.0	

scopic analysis and, thus, for the porosity test.) Although there is no significant statistical difference between the two samples, the high 11.7 reading is affecting the burnished plainware sample.

Summary

The assemblage is composed essentially of burnished plainwares and complicated stamped vessels, which are distinguished by size and thickness, as well as by surface treatment. They are not spatially distinct with reference to CALFORM mapping (White and Sexton 1981). Only three Mississippian sherds were analyzed from Feature 14AA and 14BB (Data Supplement VI). However, a number of complicated stamped sherds was recovered in the course of excavating Block Area 3 not very far away (Chapter 3, Fig. 6). Complicated sherds are concentrated around and in the structure, Feature 7, and near Features 4 and 5 in Excavation Area 1 (Fig. 45). Plainwares are more evenly represented but cluster around Features 10, 11, and 7 (Fig. 46).

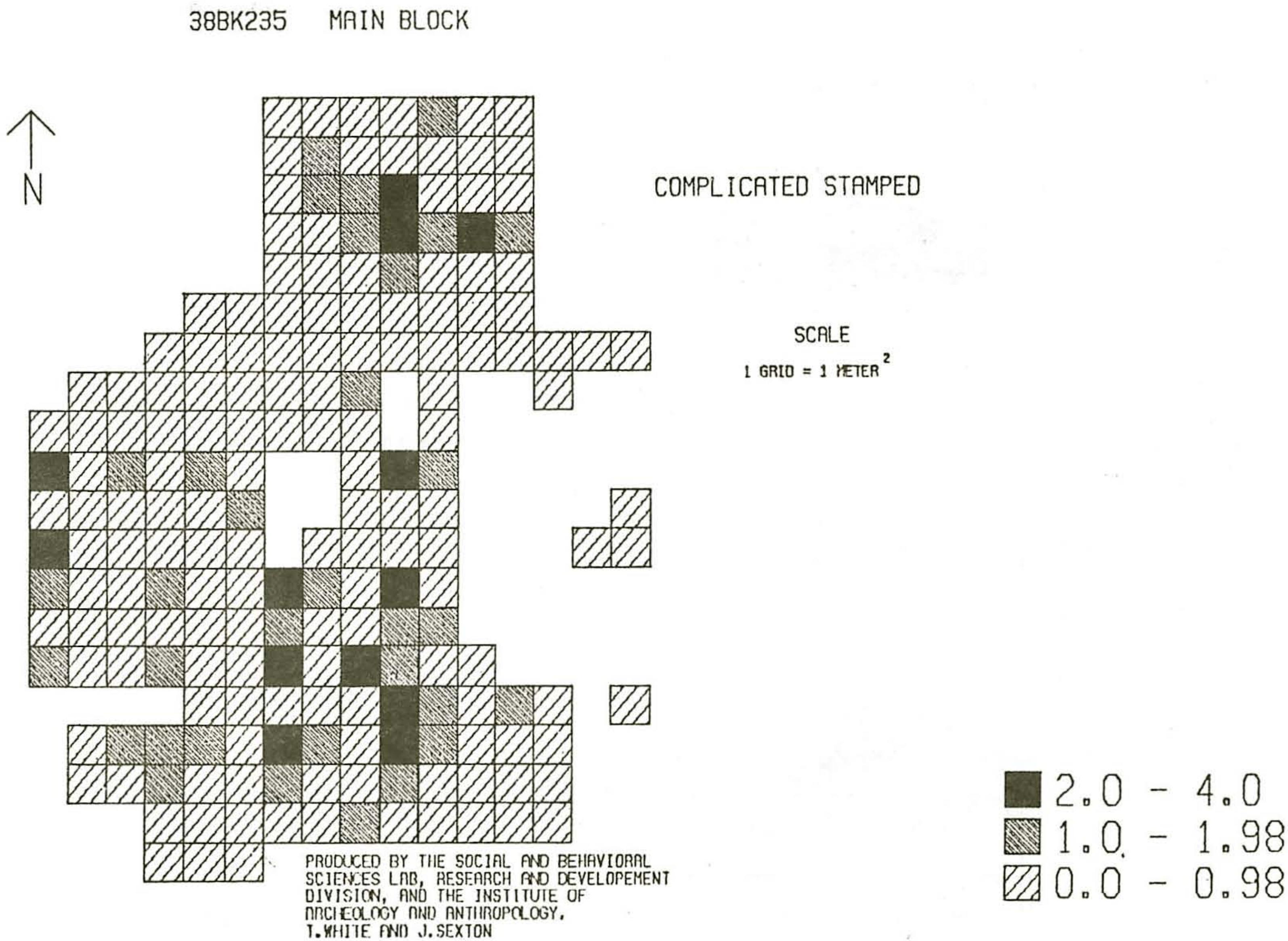


Figure 45. Spatial distribution of complicated stamped sherds.

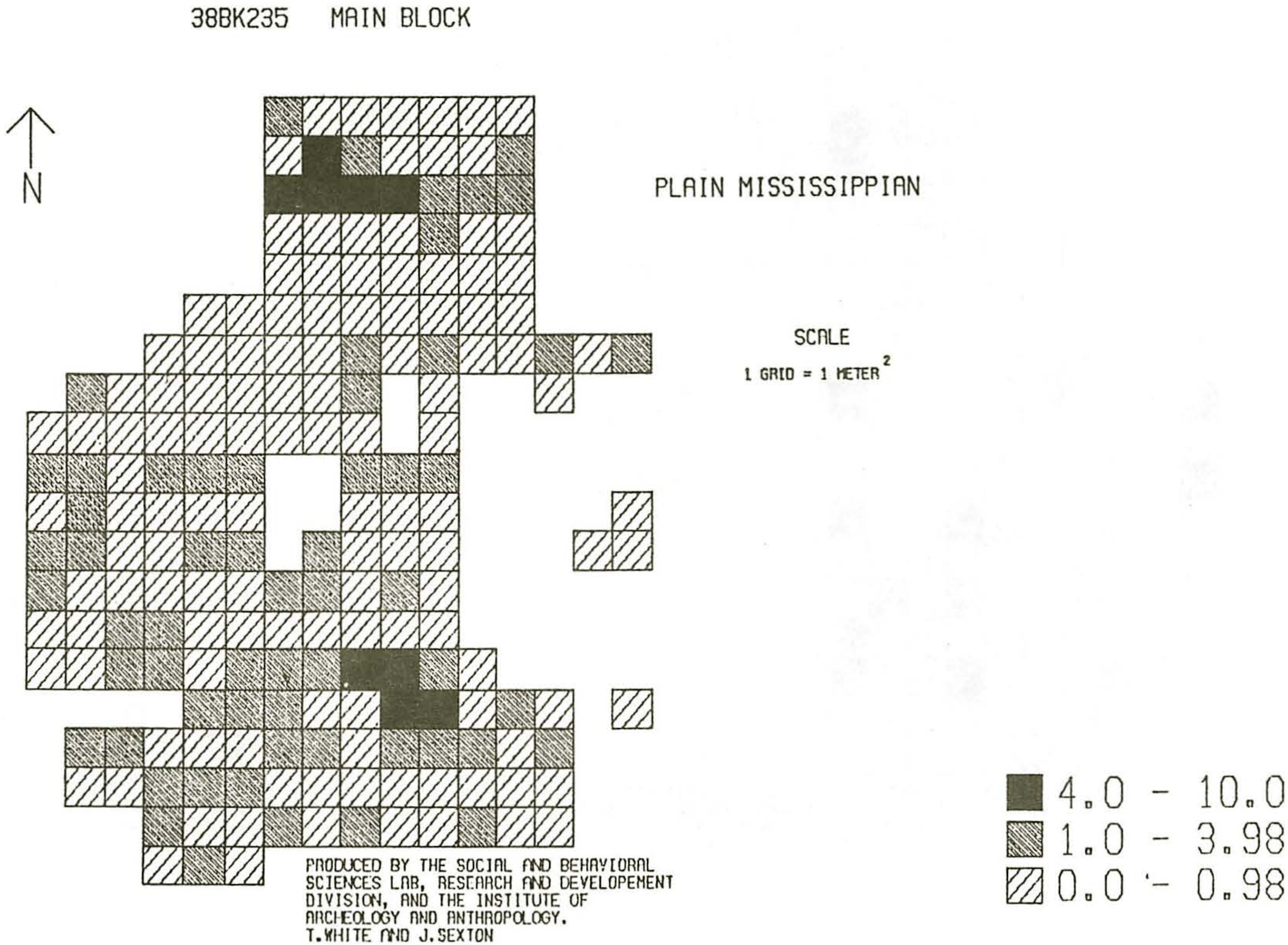


Figure 46. Spatial distribution of plain Mississippian sherds.

The minimum Mississippian vessel count equals 22 in this analysis. The rim data account for 21 Mississippian vessels. One partially complete vessel was recovered from Feature 13 during the excavation stage (Chapter 3, Fig. 6). It was an isolated occurrence without context. This complicated stamped vessel is curved slightly inward toward the base (Fig. 47). The base was missing, perhaps intentionally broken. The rim is also missing, having been removed when the feature was discovered during the blading of the site. A small plainware sherd base from another vessel was found resting at the bottom of the interior. This sherd inset is roughly square, measuring 14 cm across and 11 mm thick. It exhibits a black core. The exterior of the sherd is smoothed and polished at its point of maximum concavity.

The vessel is brown; its core color, black. The button-centered filfot motif is like that found on vessels from eastern Georgia, one from Ossabaw Island in Chatham County, Georgia (Holmes 1903: Plate CXI, CXXIa), and also like the "owl's eyes" or arc-angle motif complicated stamp in the Jeremy series, from the Jeremy Island site near McClellanville, South Carolina (Trinkley 1980). Like the Jeremy pottery, it, too, is coarsely sand tempered.

A coil break can be seen on the exterior where the base was removed; that coil was 10 mm thick. The average thickness of the vessel walls is 8 mm. The diameter of the vessel, measured at a height of 14 cm, is 24.5 cm. Since this is the lower mid-section of the vessel and since there is no evidence of a shoulder or rim, this measurement may err on the low end. The vessel's curvature measurement falls at the lower end of the range for the entire Mississippian assemblage (5-94 cm) and at the end of the range (25-94 cm) for complicated stamped sherds. The estimated volume is 4 liters.

In order to provide relative measures of functional relationships, composite values of vessel diameter and vessel volume, derived for burnished plainwares and complicated stamped pottery, were used in comparing rim data for the other 21 vessels (Table 12). Using averages does not allow consideration of the rim profiles, and thus, the ratio estimates reflect only the range of possible values and not their relationship to vessel profile.

A comparison of the burnished plainwares to the complicated stamped pottery shows stamped pottery to have a slightly higher orifice-to-volume ratio (Table 12). This composite complicated stamped vessel may have an actual functional counterpart like the one illustrated by Holmes (1903 Plate CXVa). Holmes (1903: 136) noted that this easily accessible vessel, which stands 40 cm high, was "blackened by use over fire," and he suggested that it was a cooking pot. If the plate is accurately scaled, the vessel diameter is 40 cm and its outflaring rim is 43 cm in diameter. The vessel volume based on the formula for a hemisphere is ca. 17 liters.

In this case an everted rim does not necessarily relate to orifice restriction as might be expected in storage vessels. The 14 neck forms are almost equally divided between simple restricted and elongated (Data Supplement VI). While these data do not offer much additional information

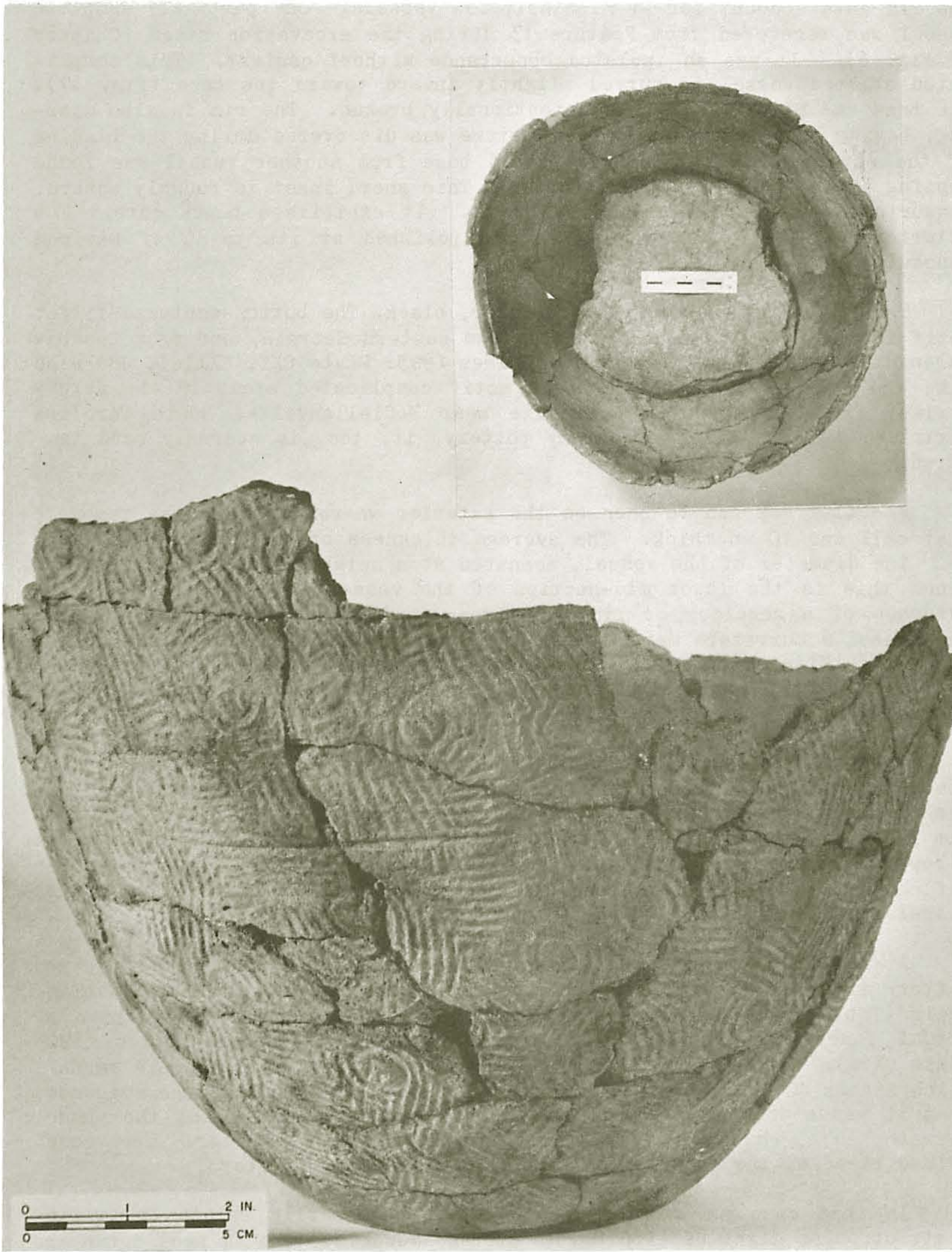


Figure 47. Feature 13, complicated stamped Mississippian vessel.

TABLE 12

MISSISSIPPIAN ASSEMBLAGE MINIMUM VESSEL NUMBER

		R I M						
VESSEL	SURFACE TREATMENT	PROFILE	DIAMETER RANGE(cm)	NUMBER	COMPOSITE VESSEL DIAMETER (cm)	AREA RATIO	COMPOSITE VOLUME (liters)	THICKNESS (mm)
1	Plain	Straight	15-19	1	34	1:4	11	7.0
2		Slightly Everted	25-29	1		1:1.6		
3		Small bowl	30-34	1		1:1.1		
4		Everted	35-39	1		1: .8		
5		Straight	50-54	2		1: .4		
6		Everted	80-84	1		1: .2		
7	Curvilinear Complicated Stamped	Straight	20-24	1	47	1:5	27	7.3
8		Everted	30-34	1		1:2		
9		Everted	55-59	1		1: .7		
10		Everted	70-74	1		1: .4	1:	
11		Slightly Everted	85-89	1		1: .3		
12		Slightly Everted	90-94	1		1: .3		

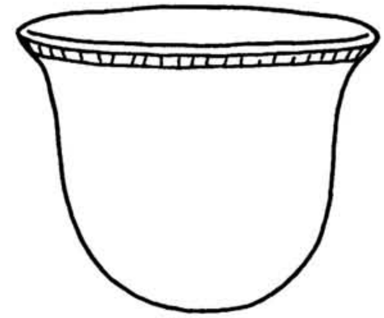
TABLE 12 (Cont.)

	R I M							
VESSEL	SURFACE TREATMENT	PROFILE	DIAMETER RANGE(cm)	NUMBER	COMPOSITE VESSEL DIAMETER (cm)	AREA RATIO	COMPOSITE VOLUME (liters)	THICKNESS (mm)
13	Rectilinear Complicated Stamped	Straight	85-89	1	47	1: .3	27	7.7
14		Slightly Everted	90-94	1		1: .3		
15	Incised	Straight	80-84	1				
16	Bold Incised	Slightly Everted	40-44	1				
17	Punctate	Everted	15-19	2				
18		Straight	75-29	1				
19	Cob-Impressed	Slightly Everted	25-29	1				
20	Applied Fillet	Everted	10-14	1				
21	Incised Punctate	Straight	30-34	1				

about possible security of vessel contents or restricted access, the 3 rounded and 1 angled shoulder suggest lower values of orifice-to-vessel circumference. If they do not reflect bowl forms, this would suggest some restriction. No doubt some of the vessels did have larger circumferences and smaller orifice-to-volume ratios associated with storage facilities.

The only small bowl rim is found in burnished plainware vessel #3. That this composite is a potential type is suggested by another illustration by Holmes (1903: Plate CXVb). If the scale is accurate, the diameter of this complicated stamped vessel is 40.4 cm. Here application of the hemispherical formula would approach an actual functional relationship, ca. 17 liters.

While a wide variety of vessel shapes and sizes obtain for the Mississippian period (e.g., Ferguson 1974: 104; Holmes 1903), it is interesting to note that the composite vessel form represents a vessel type found in the Wateree drainage of South Carolina (Ferguson 1974: 107d), as illustrated:



The composite Mississippian vessel from the assemblage at 38BK235 is a 7 mm thick, brown pot with an outflaring rim, having medium to very coarse sand tempering. Its orifice-to-volume ratio is high, and its volume, depending upon whether it is a burnished plainware or complicated stamped pot, would be 11 liters or 27 liters respectively. This composite agrees with the way Holmes characterized the South Appalachian stamped wares:

> The most strongly marked characteristics of this ware are its material, which is generally hard, heavy, and coarsely silicious; its shapes, the most notable of which is a deep caldron with conic base and flaring rim; and its decoration, which consists in great part of stamped figures of no little technic and artistic interest (Holmes 1903: 131).

Description and Analysis in the Microscopic Study

The ceramic analysis included a special compositional study that used petrographic thin-sectioning and X-ray diffraction first to identify the clay materials and second to establish the range of compositional variability as it related to the manipulation of the clay in ceramic production. In order to identify and compare the clay materials, local clay sources were analyzed. Nine clay sources in the immediate vicinity, within ca. 1 km of the site areas investigated by the Institute, were sampled. The collection was opportunistic, i.e., the samples were collected after construction and land-clearing operations had exposed clay-bearing strata. The kaolinite and opaline clays that were collected within 3 to 4 m of the surface would probably have been exposed in the river or creek beds and would thus have been available to the aboriginal potters. Each clay sample was divided into six sub-samples (if enough material was present) and fashioned into ceramic test tiles, which were then fired at a range of temperatures between 500° and 900° C in 100° increments. The controlled firing of the ceramic test tiles was accomplished by using a regulated muffle furnace (Lindberg Model 51848) that simulates an oxidizing atmosphere.

A combination petrographic and X-ray diffraction comparative analysis was used to determine the degree of variance between the test tiles and the sherds and between the Middle-Late Woodland and Mississippian assemblages. A representative sample of 96 sherds was selected from the two sites based on a preliminary analysis of the differences in temper size, thickness, and surface treatment just discussed: 36 sherds from the Middle-Late Woodland assemblage at 38BK236, 45 sherds from the Mississippian component at 38BK235, and 15 sherds from the Woodland component at 38BK235. This represents approximately a 5% sample of the 2,126 analyzed sherds.

Each sherd was divided into three sub-samples. One was used for petrographic thin-sectioning. The sherds and clay tiles were embedded in a bioplastic, cut and mounted on a slide, and then trimmed and ground down to a thickness of 20-30 microns (.02-.03 mm). The second sub-sample was finely ground (by hand, using a mortar and pestle) for the X-ray diffraction analysis. The last portion was set aside for use in the porosity study and as a comparative specimen.

Three sets of observations involving mineralogical, structural, and technological properties were made on the sherds and test tiles. The variables used in the petrographic analysis were recorded as present or absent: a single occurrence was recorded as present. A total of 66 sherds and 20 tiles was used for the petrographic analysis: 11 unfired test tiles; 9 tiles fired at 900° C; 30 sherds from the Mississippian house at 38BK235; and 36 sherds from the Middle-Late Woodland assemblage at 38BK236.

Eighty-eight sherds and 67 test tiles were used in the X-ray diffraction analysis. The specimen was bombarded with an X-ray beam and the angles of the reflection from the minerals present in the sample were automatically measured and plotted on a chart. The intensities of the plotted peaks are controlled by variables such as a time constant, gain, range, and scanning time, which eliminates much of the low-level noise. In this case, the time constant was 1; gain, 256; range, 1 k; and scanning time, 2° per minute.

The first set of variables examined was mineralogical. The clays in the project area, which lie between the Dorchester and Summerville scarps, derive from the Penholoway Terrace (Data Supplement III; Colquhoun 1965). This Pleistocene terrace formation may be divided into three stratigraphic units. The top unit is a medium- and coarse- and fine-grained, moderately well-sorted, slightly clayey sand with Bar and Barrier Island facies. The middle unit is a clayey, fine silty sand in the west, grading to a clayey, silty, fine sand, blue-gray marl in the east with sublittoral, shallow, shelf facies. The bottom unit is composed or coarse- and medium-grained, well-sorted sand with littoral facies.

Underlying this terrace is the Hawthorne Formation (a slightly clayey, dark greenish brown, fine to medium quartz sand with sand-size phosphate grains). This formation intergrades with the Cooper Marl (a fine-grained, clayey, silty, very calcareous, olive-green sand) and overlies the Santee Limestone, which consists of micritic limestone to skeletal micritic limestone that is sometimes glauconitic (Data Supplement III; L. Campbell, S. Campbell, Colquhoun, and Ernissee 1975).

Although the mineralogical and structural make-up of the local clays has not been studied extensively (cf. Data Supplement III), geologists at the University of South Carolina (M. Andrejko, R. Gardner, D. Nelson, and D. Colquhoun) were able to suggest several mineral and clay mineral groups that might be diagnostic. Four mineral groups are strongly represented in the samples (Tables 13-17): quartz; pyrites and iron oxides (Fe_2, Fe), feldspar (silicates of aluminum with potassium, sodium, and calcium, and rarely barium); also some opaque minerals. The carbonates are absent probably due to the significant presence of quartz (see Blatt, Middleton, and Murray 1980: 447). The feldspathic materials and the opaque minerals do not occur naturally in the Coastal Plain clays; they are introduced via surface water or air (D. L. Nelson, personal communication; see also Colquhoun 1981: 5, 9).

The distribution of the feldspars is nonrandom. A significant difference occurs between the clays and sherds. Feldspar, which is strongly represented in the clay tiles, but which shows minimal traces in the sherds (Table 13), has a tendency to weather at a faster rate than quartz. Because of the geological length of this weathering process, relative to the archeological deposition and erosion at sites 38BK236 and 38BK235, the feldspar had probably already weathered from the clay sources used in the vessels represented by half of the sherd sample. The raw clay materials used in the comparison, however, had been exposed by recent bulldozing and had not been subjected to weathering like an older, more exposed outcrop.

The presence or absence of certain minerals cannot conclusively prove that the clay minerals in the raw clay are the same as those in the paste. The X-ray diffraction of the raw clay samples reveals the presence of quartz in all samples (Table 14). Kaolinite, while present in 30% of the samples, is destroyed at such low temperatures that it is not useful for comparison with sherd pastes. The molecular structure of the clays and clay minerals begins to destruct at approximately 550° C. The tile and sherd samples would have to be fired (refired) at temperatures up to and above 1100° C for longer periods of time in order to identify positively the presence of cristobalite (SiO2), mullite (AlSiO13), enstatite ($Mg[Si_2O_6]$), and spinel ($MgAl_2O_4$), that can be traced at these higher temperatures (Shepard 1968; Isphording 1974; D. L. Nelson, personal communication).

Although traces of other minerals occur (Table 14; Data Supplement III), the X-ray diffraction shows two basic categories of measurable intensities relating to the feldspars. The first is a strong quartz and feldspar combination and the second is a strong quartz with minimal-to-absent feldspar. Feldspar is differentially distributed among the clay samples and differentially distributed over the range of firing temperatures, but these differences do not appear significant (Table 15).

The sherds were categorized according to these two intensities. A chi-square test of the Woodland and Mississippian ceramic assemblages and the clay tiles tends to support their basic similarity (Table 15), even

TABLE 13

PETROGRAPHIC COMPARISONS*

Variables	38BK236 Middle-Late Woodland Pottery n = 36	38BK235 Mississippian Pottery n = 30	Unfired Clay Tiles n = 11	Fired (900° C) Clay Tiles n = 9	Probability	Chi-Square df = 3
MINERALS						
Quartz	36	30	11	9	P = 1	0
Feldspar	18	16	11	9	P = .002	15.521
Pyrite, Iron Oxides	18	20	8	7	P = .27	3.964
Other Opaque Minerals	33	25	9	9	P = .57	2.766
STRUCTURE						
Grains--Angular	33	27	10	9	P = .81	.951
Grains--Graded	24	23	10	9	P = .23	4.326
Sorting--Poor	28	23	10	8	P = .67	1.593
Fissility	19	17	10	5	P = .15	5.327
Void Space	11	9	3	6	P = .18	4.923
TECHNOLOGY						
Banding	19	21	0	2	P = .0006	18.652
Color--Brown/Black	28	27	5	9	P = .006	12.548

*Numbers score presence

TABLE 14

TABULATIONS OF RAW CLAY MATERIALS USING X-RAY DIFFRACTION

SAMPLE #	DEGREES FIRED	QUARTZ	FELDSPARS	KAOLINITE	OTHER
18A	Unfired	X	X	X	
18D	700c	X	X	Slight	
18E	800c	X	X	Slight	
18F	900c	X	0	0	
19A	Unfired	X	0	X	Microcline
19D	700c	X	0	0	Present in
19E	800c	X	X	0	all Samples
19F	900c	X	X	0	
20A	Unfired	X	0	X	Possible
20E	800c	X	X	0	Mica
20F	900c	X	X	0	
21A	Unfired	X	X	X	
22A	Unfired	X	X	X	
22B	500c	X	X	X	
22C	600c	X	X	Slight	
22D	700c	X	X	0	
22E	800c	X	X	0	
22F	900c	X	X	0	
23A	Unfired	X	X	X	
24A	Unfired	X	X	0	Possible
24B	500c	X	X	0	Montmoril-
24C	600c	X	X	0	lonite
24D	700c	X	X	0	Clay
24E	800c	X	Slight	0	
24F	900c	X	X	0	
25A	Unfired	X	X	0	Unidenti-
25B	500c	X	X	0	fied Clay
25C	600c	X	Slight	0	Body
25D	700c	X	Slight	0	
25E	800c	X	Slight	0	
25F	900c	X	Slight	0	
26A	Unfired	X	X	X	
26B	500c	X	0	X	
26C	600c	X	0	0	
26D	700c	X	0	0	
26E	800c	X	Slight	0	
26F	900c	X	X	0	

TABLE 14 (Cont.)

SAMPLE #	DEGREES FIRED	QUARTZ	FELDSPARS	KAOLINITE	OTHER
27A	Unfired	X	X	X	
27B	500c	X	X	Slight	
27C	600c	X	X	0	
27D	700c	X	X	0	
27E	800c	X	X	0	
27F	900c	X	X	0	
28A	Unfired	X	X	X	
28B	500c	X	Slight	0	
28C	600c	X	Slight	0	
28D	700c	X	X	0	
28E	800c	X	X	0	
28F	900c	X	X	0	
29A	Unfired	X	Slight	X	
29B	500c	X	Slight	Slight	
29C	600c	X	Slight	0	
29D	700c	X	Slight	0	
29E	800c	X	Slight	0	
29F	900c	X	Slight	0	
30A	Unfired	X	X	X	Possible
30B	500c	X	X	0	Carbonates
30C	600c	X	Slight	0	
30D	700c	X	Slight	0	
30E	800c	X	Slight	0	
30F	900c	X	Slight	0	
31A	Unfired	X	0	X	
31B	500c	X	0	X	
31C	600c	X	Slight	0	
31D	700c	X	Slight	0	
31E	800c	X	0	0	
31F	900c	X	0	0	

X = Presence   0 = Absence

TABLE 15

X-RAY DIFFRACTION COMPARISONS

Minerals	Unfired Clay Tiles	Fired Clay Tiles (500-600° C)	Fired Clay Tiles (800-900° C)	Total Clay Tiles	Woodland Assemblage	Mississippian Assemblage
Strong Quartz and Feldspars	10	8	13	36	22	23
Quartz with Minimal or No Feldspars	4	10	11	31	28	15
	14	18	24	67	50	38

$n = 56$ $x^2 = 2.344$, df = 2 P = .31

$n = 155$ $x^2 = 2.466$, df = 2 P = .29

though the feldspathic materials have been identified only generally. Without further analysis of the surrounding clay sources, however, the degree of similarity among these samples, relative to other clays, is unknown.

Although presence/absence data and small sample sizes may not provide adequate statistical descriptions, differences in the mineralogical composition may be compared by surface treatment to distinguish possible trends. In comparing differences between the plainwares and stamped sherds, as done in the macroscopic analysis, no significant differences are noted in the petrographic analysis of the Middle-Late Woodland assemblage (Table 16). There is a slight difference in the plain sherds from the X-ray diffraction results for the Woodland assemblage at 38BK235, however (Table 17). The plain sherds have little or no feldspar. There is also a slight difference between the plainwares and stamped sherds in the assemblage from 38BK236 (n = 35, x^2 = 3.224, P = .07, df = 1). There is no significant difference between the Woodland assemblages from the two sites (n = 50, x^2 = 1.705, P = .19, df = 1). When the two samples are combined, no significant differences emerge between the plainwares and stamped sherds (n = 50, x^2 = .079, P = .78, df = 1).

Only one possible difference occurs in the feldspar patterning in the petrographic analysis of the minerals in the Mississippian assemblage (Table 18). There is no difference between the burnished and complicated stamped sherds (n = 20, x^2 = .238, P = .63, df = 1); but when the plain sherds are considered, the burnished sherds are slightly higher in feldspar than expected. In comparing the results of the X-ray diffraction analysis (Table 19), there is no apparent difference between the sherds from the main house and the bone pit (n = 38, x^2 = .078, P = .78, df = 1).

The second set of variables is structural (Table 13). The angularity of the mineral grains within the samples suggests that the materials came from a wind-blown rather than a water-transported deposit (D. L. Nelson, personal communication). However, several factors affect the degree of roundness. Wind abrasion can produce rounded grains, and conversely finer sand grains carried in suspension may be protected from abrasion (Blatt, Middleton, and Murray 1980: 83-84). The structure of common quartz is such that the coarser grains are reduced in size by flaking (Blatt, Middleton, and Murray 1980: 84).

The grains do not show any sizing differences that might correlate with the degree of porosity. That is, uniform grains have a greater freedom to expand than graded sizes which pack more tightly (Shepard 1968: 127). Approximately half of the sherds exhibit planes of weakness (fissility), which suggests a higher probability of breakage. The raw clay materials exhibit fissility, but in minor proportions. This may be due to fashioning the clay into test tiles, which requires a longer handling of the clay than rolling it into coils.

There is no significant difference in the structure of the paste between the plainwares and stamped sherds in the Middle-Late Woodland assemblage. A more detailed examination by surface treatment shows a slight difference in grain angularity for the cross simple stamped sherds (Table 16). No significant structural differences are found between the burnished

TABLE 16

PETROGRAPHIC COMPARISON BY SURFACE TREATMENT*
38BK236--Middle-Late Woodland

Variability	Plain n = 10	Fabric Impressed n = 7	Linear Check Stamped n = 6	Cross Simple Stamped n = 6	Check Stamped n = 4	Simple n = 2	Probability	Chi-Square df = 5
MINERALS								
Quartz	10	7	6	6	4	2	P = 1	0
Feldspar	5	2	4	2	1	2	P = .26	6.555
Pyrite, Iron Oxides	6	4	1	3	3	1	P = .53	4.184
Other Opaque Minerals	10	6	5	5	4	2	P = .73	2.795
STRUCTURE								
Grains--Angular	10	5	6	3	4	2	P = .05	11.083
Grains--Graded	8	5	5	6	3	0	P = .12	8.845
Sorting--Poor	9	5	6	5	4	2	P = .59	3.763
Fissility	5	6	3	2	3	0	P = .22	7.033
Void Space	10	7	6	6	4	2	P = 1	0
TECHNOLOGY								
Banding	8	6	1	4	2	2	P = .07	10.039
Color--Brown	9	4	1	4	2	2	P = .07	10.239
Black	1	3	5	2	2	0		

*Numbers score presence

TABLE 17

X-RAY DIFFRACTION COMPARISON BY SURFACE TREATMENT
WOODLAND ASSEMBLAGES

38BK236 Middle-Late Woodland

	Plain	Fabric	Linear Check Stamped	Cross Simple Stamped	Check Stamped	Simple Stamped	Cord marked
Strong Quartz and Feldspars	8	5	2	1	1	0	1
Quartz with Minimal or No Feldspars	2	2	4	4	3	2	0

n = 35 x^2 = 11.333, df = 6 P = .08

39BK236 Woodland Component

	Plain	Fabric	Linear Check Stamped	Cross Simple Stamped	Incised	Simple Stamped	Dentate
Strong Quartz and Feldspars	0	1	0	1	1	0	1
Quartz with Minimal or No Feldspars	6	1	1	0	0	3	0

n = 15 x^2 = 12.443, df = 6 P = .05

TABLE 18

PETROGRAPHIC COMPARISON BY SURFACE TREATMENT*
38BK235--MISSISSIPPIAN COMPONENT

Variables	Plain n = 10	Burnished n = 10	Complicated Stamped n = 10	Probability	Chi-Square df = 2
MINERALS					
Quartz	10	10	10	P = 1	0
Feldspar	6	8	6	P = .06	5.34
Pyrite, Iron Oxides	5	5	7	P = .59	1.086
Other Opaque Minerals	10	10	10	P = 1	0
STRUCTURE					
Grains--Angular	10	10	10	P = 1	0
Grains--Graded	9	6	8	P = .03	2.609
Fissility	7	8	8	P = .83	.373
Void Space	10	10	10	P = 1	0
TECHNOLOGY					
Banding	9	3	6	P = .02	7.50
Color--Brown	8	5	7	P = .35	2.1
Black	2	5	3		

*Numbers score presence

TABLE 19

X-RAY DIFFRACTION COMPARISON BY SURFACE TREATMENT
MISSISSIPPIAN ASSEMBLAGE

Feature 7: Main House

	Plain	Burnished	Complicated Stamped
Strong Quartz and Feldspars	5	8	6
Quartz with Minimal or No Feldspars	5	2	4

n = 30 x^2 = 2.01, df = 2 P = .37

Feature 14: Bone Pit

	Plain	Complicated Stamped
Strong Quartz and Feldspars	2	2
Quartz with Minimal or No Feldspars	3	1

n = 8 x^2 = .533, df = 2 P = .77

and complicated stamped sherds in the Mississippian assemblage. However, there is less grading of grains in the burnished sherds when the entire assemblage is considered (Table 18). In a similar study of Florida ceramic sherds, Pearson (Pearson and Upchurch 1978) noted a sorting of grain sizes in sherds that had been burnished.

The third and final set of variables examined are technological. The pastes are primarily brown and black. The differences in the banding and color (Table 13) relate to the color of the clays and the firing conditions. The presence of the iron oxides in the matrix may contribute to the strong representation of the brown and black color categories in the ceramic assemblages. The controlled oxidizing atmosphere of the muffle furnace contributes to the gradual color change of the clay tiles, the orange clays firing to various shades of orange and the dark clays to buff.

While evidence of color banding and black cores might suggest that the materials were fired in a reducing atmosphere (Colton 1953), Shepard (1968: 86ff, 217ff) makes a distinction between the process of oxidation during firing and a reducing atmosphere. In an uncontrolled atmosphere, in direct, open firing, there may not be complete oxidation. Oxidation and firing temperature both affect the color of the paste. The ethnographic accounts do not distinguish between them (Shepard 1968: 86).

The absence of kaolinite in the sherds indicates that the pottery was fired above 600° C (see also Table 14). Nonkiln firing temperatures probably do not exceed 1000° C (Shepard 1968: 83). However, recent controlled firing experiments conducted by John Carpenter, Department of Geology, University of South Carolina (personal communication), show that when local clays are pit-fired and the fire is fueled by pine and oak, the fire can burn upward to 1100° C (monitored by cones) for a sustained period.

Based on mineralogical data, Steponaitis (1980: 57) estimates that the Moundville pottery was fired between 550-750° C, and Million's replicative experiments indicate a firing temperature of 600° C for Mississippian pottery in northeast Arkansas. Further analysis is necessary to estimate the firing temperature of the pottery represented by the Woodland and Mississippian archeological assemblage. Such an analysis would require X-ray scans of the sherds refired in controlled increments to monitor crystal growth. Treatment of the sherds and clays with ethylene glycol to reveal traces of the original clay pattern would determine whether the pottery was fired at low temperature (Ronald Bishop, personal communication).

No significant differences appear between plainwares and stamped sherds in the Middle-Late Woodland or between the burnished and complicated stamped sherds in the Mississippian assemblage. A more detailed examination reveals slight differences by surface treatment, i.e., differences in banding and color in the linear check stamped in the Middle Woodland assemblage (Table 16) and differences in banding in the burnished ware in the Mississippian assemblage (Table 18).

Summary

This compositional analysis is a beginning attempt to characterize prehistoric pottery in South Carolina. At this level of analysis, the late prehistoric assemblages appear to be fairly homogeneous; that is, they appear to be locally produced and they exhibit little compositional variability due to the technical manipulation of the clay. The clays and sherds appear to be basically similar in their mineralogical, structural, and technological dimensions. Since no other comparable ceramic analysis has been performed in South Carolina, the differences in the clays are not well understood. Because pottery manufacture was considered to be a localized industry, the scale of differences between the Middle-Late Woodland and Mississippian assemblages was expected to be small. In terms of measuring the potential functional variability as it relates to the composition of the clays in these and other assemblages, more refined methods must be used, e.g., consideration of point-count data for the mineralogical constituents and semi-quantified characterization of the grain size, shape, density, and packing of the mineral inclusions.

Comparative Summary

Differences between the Middle-Late Woodland assemblage (n = 411) and the Mississippian assemblage (n = 323) are compared along three functional dimensions involving vessel morphology, composition, and surface treatment. Hypothesizing differences in general vessel form and formulating diversity indices are possible because of the comparable sample size. Determining the range of functional variability for the Mississippian assemblage has been compromised to some degree because of the necessity to isolate the Mississippian component on the basis of surface treatment. Insofar as ceramic surface treatment differences are temporal indicators, this is not a formidable problem. However, the temporal range and/or spatial extent of many wares are not very discrete. The interpretations of the Middle-Late Woodland and Mississippian assemblages should be viewed as a first approximation of potential differences.

There appear to be more and larger-sized vessels in the Mississippian ceramic assemblage. The minimum number of vessels represented in the Middle-Late Woodland analysis is 10; in the Mississippian, which has a smaller sample size, 23. Mississippian vessels are on the order of 1.5 times larger than Middle-Late Woodland vessels (Table 20). This larger size can reflect a larger social group, greater storage capability, specialized subsistence, serving, or specialized functions. Most of these correspond directly to a subsistence/settlement base that would support a larger population, create or allow food storage facilities, or support specialized endeavors.

Not only is there a greater number of vessels represented in the Mississippian assemblage, but the range of vessel forms (based on the rim profile data) is greater. A diversity index calculated for the rim profiles appears in Table 21. The diversity index is based on the principle that

TABLE 20

COMPARISON OF THE COMPOSITE VESSEL FORM

	MIDDLE-LATE WOODLAND ASSEMBLAGE	MISSISSIPPIAN ASSEMBLAGE
Diameter	35 cm	39 cm
Area Ratio Rim: Curvature	1:1.1	1: .44
Volume	11 liters	15 liters
Volume Ratio Orifice: Volume	low-to-moderate	high
Thickness	7.4 mm	7.1 mm

the less chance of occurrence of items in each category, the less diverse the assemblage (see Dickens 1980: 40-41). It is thus based on the degree of dissimilarity as opposed to the number of categories represented that is the usual basis for diversity measures. Although statisticians disagree on an appropriate formula to measure this degree of dissimilarity, tests using two different formulas yielded similar results (Dickens, personal communication).

The diversity index of the rim profiles within the Middle-Late Woodland assemblage indicates that two rim sherds will be different about 50% of the time, whereas in the Mississippian assemblage two rim sherds will be different over 67% of the time. About 67% of the time, two rim sherds will come from different assemblages as well. Of course, this index is dependent upon the size of the vessels and the number of vessels in the assemblage. The homogeneity of the Middle-Late Woodland assemblage may be partially attributable to the small number of vessels. If the sample size were larger, a bias caused by greater numbers of broken rim sherds from large vessels would exist. This bias would require a corrective factor (see Million 1977, also Braun 1980a).

The higher rim-to-horizontal curvature ratios and volume ratios (Table 20), reflect a tendency for the composite Mississippian vessel to have an outflaring rim, suggesting that a good percentage of the assemblage has easier vessel access and less need to contain vessel contents. While the composite vessel profile is indicative of processing and serving functions (see Table 4), the range of area ratios is broader for the Mississippian at 1:5 to 1:0.2 than for the Middle-Late Woodland assemblage at 1:2.5 to 1:0.1. This range of area ratios indicates the potential for larger storage (restricted access) vessels in the Mississippian period, as well as a large number of serving/processing vessels.

If some of these vessels are assumed to be cooking or serving vessels, estimating serving portions for the composite vessels may be of interest. As White illustrates, "They seetheynge of the meate of earthen pottes," (Swanton 1946: Plate 54) and as further described by Hariot in the late 1500s:

> They or their women fill the vessel with water, and then putt they in fruite, flesh, and fish, and lett all boyle together like a galliemanufrye, which the Spaniards call, olla podrida (Swanton 1946: 554).

Swanton (1946: 354) provides a number of references to porridges prepared in kettles. With respect to the eastern woodlands and communal cooking situations (Fenton 1968: 61ff), the Indians consumed one regular meal daily, eating small amounts. The Iroquois cooked their food in the morning and kept it warm during the day (Fenton 1968: 61). In their attempt to arrive at estimates of household size for Southwestern pueblos, Turner and Lofgren (1966) calculated the average serving size of a "cooking pot" at 691 cc (.7 liters or 3 cups). This calculation does not specifically address the type of food, nutritional needs, person size, or serving frequencies. Obviously, the larger composite volume of the Mississippian vessels would hold more servings. However, as a rough estimate, the ratio of Mississippian to Middle-Late Woodland serving would be 3:2.

TABLE 21

DIVERSITY INDICES OF RIM PROFILES

Within Middle-Late Woodland Assemblage

Profile	Number	Percentage
Everted	3	6
Slightly Everted	11	21
Straight	32	63
Small Bowl	5	10

$$D_w = 1 - [(.06)^2 + (.21)^2 + (.63)^2 + (.10)^2] = .55$$

Within Mississippian Assemblage

Profile	Number	Percentage
Greatly Everted	1	2
Everted	8	17
Slightly Everted	19	40
Straight	16	33
Small Bowl	2	4
Inverted	2	4

$$D_w = 1 - [(.02)^2 + (.17)^2 + (.40)^2 + (.33)^2 + (.04)^2 + (.04)^2] = .70$$

Between Assemblages

$$D_b = 1 - [(.06 \times .17) + (.21 \times .40) + (.63 \times .33) + (.10 \times .04)] = .69$$

The relationship between the vessel volume for the ceramic assemblages on the interior Lower Coastal Plain of South Carolina compares well with the estimates for the Late Woodland and Mississippian ceramic assemblages from the Zebree site in northeastern Arkansas (Morse and Morse 1977). Based on the reconstruction of Barnes jars from the Late Woodland period, Million and Morse (1977) calculate an average volume of 17 liters, ranging evenly between 13 and 24 liters. The Varney Red Film jars from the Mississippian assemblage cluster around 50 liters, 13 liters, and 3 liters (Million 1977). An extremely large jar form, in excess of 50 liters, is also found in Neeley's Ferry Plain from the same assemblage: 57 liters.

The complicated stamped pottery in the Mississippian assemblage ranges between 27 and 48 liters based on the different curvature estimates. The Middle-Late Woodland composite vessel of 11 liters and the Mississippian complicated stamped composite vessel of 27 liters have almost the same 1:3 ratio as the Barnes jar has to the large Varney Red Film jar. The burnished plainwares from the Mississippian assemblage and the Middle-Late

Woodland composite vessels have estimated capacities of 11 liters each, which suggest that medium-sized vessels continue from the Middle-Late Woodland to the Mississippian.

The vessel thickness between the two vessel composites (Table 20) is almost the same. However, both assemblages show a difference in thickness between the plainwares and stamped pottery. The stamped pottery appears to average slightly thicker, 1 mm. The stamped vessels in the Mississippian assemblage are also larger. With the present data, a similar pattern in the Middle-Late Woodland is difficult to assess (Table 9).

A comparison of the compositional properties shows no differences between the assemblages at this level of analysis (Table 22). The pottery was most likely produced locally by the late prehistoric groups. However, certain manufacturing techniques are still open to question, e.g., firing temperature and the addition of tempering materials. The suggestion that burnished plainwares in the Mississippian assemblage require firing at low temperatures might indicate that the Mississippian potters were controlling the firing process. However, some smoothing may have happened after firing. According to a Creek informant, pots were "smoothed" with a corncob before the pots cooled completely (Swanton 1946: 552). This technique might account for the polish observed on pots that look highly fired. Descriptions of pottery manufacture for the Catawba burnished ware does not indicate smoothing after firing. Instead, after a three day drying period, the surface was polished with a stone for half an hour, baked before the fire for an hour, and then fired (Holmes 1903: 54-55). Additional pottery-forming experiments must be performed in order to characterize these assemblages.

Diversity indices calculated for temper size (Table 23) indicate a slight difference between the assemblages attributable to the higher percentage of very coarse grains in the Middle-Late Woodland assemblage. Recent experimental studies of the Moundville pottery conducted by Steponaitis (1980: 82) suggest that coarse-grained temper would probably increase the durability of cooking vessels. Pots with finer temper, while having greater strength initially, could not withstand thermal stress. If the Middle-Late Woodland vessels are multifunctional, as hypothesized, then coarsely tempered pots might be more advantageous. Even though they have less initial strength, they could withstand repeated thermal shocks.

The fact that there is no detectable relationship between temper size and thickness in the macroscopic analysis and no difference between the clays and sherds in the petrographic analysis based on presence/absence data raises the issue of whether temper was added to the sandy clays during pottery manufacture. There is slight evidence that temper size may relate to surface treatment; there is more evidence that surface treatment relates to thickness.

The grain size distribution of sediments, albeit composed of distinct populations, should exhibit a normal distribution. Although the parent materials affect size, clastic particles from different localities and environments approximate a lognormal distribution with a mean of 3.2 phi or very fine sand (Blatt, Middleton, and Murray 1980: 69). Blatt estimates the distribution of clastic quartz as lognormal with a mean of 4 phi (very

TABLE 22

COMPARISON OF COMPOSITIONAL PROPERTIES

Variables	Middle-Late Woodland Assemblage	Mississippian Assemblage	Sample Size	Test	Degrees of Freedom	Probability
MINERALS						
Quartz	36*	30	n = 66	x^2 = 0.	1	1.0
Feldspar	18	16	(M-L W = 36	.001		.98
Pyrite, Iron Oxides	18	20	M = 30)	1.241		.26
Other Opaque Minerals	33	25		.428		.52
Strong Quartz and Feldspars (X-ray)	22	23	n = 88 (W = 50 M = 38)	1.745		.18
STRUCTURE						
Grains--Angular	33	27	n = 66	.038		.84
Grains--Graded	24	23	(M-L W = 36	.385		.54
Sorting--Poor	28	23	M = 30)	.035		.85
Fissility	19	17		.005		.94
Void Space	11	9		.048		.82
TECHNOLOGY						
Banding	19	21		1.376		.24
Color--Brown/Black	28	27		.990		.68
POROSITY (percentage)	$\bar{x}$ = 5.7	$\bar{x}$ = 6.0	n = 91 (W = 52 M = 39)	t = .659	89	> .5

*Numbers record presence

TABLE 23

DIVERSITY INDICES OF TEMPER SIZE

Within Middle-Late Woodland Assemblages

Temper Size	Number	Percentage
Silt	2	1
Very Fine	10	2
Fine	20	5
Medium	54	13
Coarse	56	14
Very Coarse	220	53
Granules	49	12

$$D_w = 1 - [(.01)^2 + (.02)^2 + (.05)^2 + (.13)^2 + (.14)^2 + (.53)^2 + (.12)^2] = .67$$

Within Mississippian Assemblages

Temper Size	Number	Percentage
Silt	1	0.3
Very Fine	10	3
Fine	34	11
Medium	88	27
Coarse	84	26
Very Coarse	92	28
Granules	14	4

$$D_w = 1 - [(.003)^2 + (.03)^2 + (.11)^2 + (.27)^2 + (.26)^2 + (.28)^2 + (.04)^2] = .77$$

Between Assemblages

$$D_b = 1 - [(.01 \times .003) + (.02 \times .03) + (.05 \times .11) + (.13 \times .27) + (.14 \times .26) + (.53 \times .28) + (.12 \times .04)] = .77$$

fine sand to coarse silt), although the mean size of quartz grains can differ, being finer in ocean basin sediments (Blatt, Middleton, and Murray 1980: 70, 291).

The Pliocene-Pleistocene sediments in the site area (Data Supplement III) are fine-to-medium grained, 1.5 to 2.5 phi. Sjoberg (Data Supplement V) performed a grain size analysis of 11 samples from Feature 14BB, site 38BK235. He determined that the samples had not been affected culturally. The average grain size distributions for these samples are 24% for the medium-sized grains, 24% for the coarse-sized grains, and 7% for the very coarse-sized grains. These distributions cannot be extrapolated to the local sediments without further analyses.

While the results of this petrographic analysis indicate that the grains are graded (though not 100%), the grain size distribution must be semiquantified in order to determine whether or not the macroscopic differences are observational biases caused by the natural distribution of the grains in pottery clays and/or the visual impact of larger temper. In this case, higher than normal percentages of very coarse temper in both assemblages would seem to indicate either the addition of very coarse temper or the selection of deposits with extremely coarse grains. Furthermore, the almost even distribution of pottery within the medium, coarse, and very coarse categories in the Mississippian assemblage may indicate more functionally specific vessels.

Substantive results from this analysis tend to support the hypothesized differences in the subsistence/settlement pattern between the two periods, insofar as domestic functions relate to the use of more vessels, larger-sized vessels, and a more diverse range of vessels in the Mississippian as compared to the Middle-Late Woodland period. This analysis, an effort to document functional variability along several dimensions, is the first study of its kind in the interior Lower Coastal Plain of the Carolinas. Few, if any, multidimensional analyses to characterize and compare entire ceramic assemblages have been undertaken in the Southeast (compare Moundville). It follows the growing number of advanced studies from the Southwest (e.g., Braun 1980a; Plog 1977), the Midwest (Braun 1980b); Million 1977), and the Southeast (Steponaitis 1980). Despite the pioneering work of Anna Shepard, the new development and use of techniques to obtain and measure appropriate and functionally relevant data sets have only now begun to impact ceramic interpretations in the United States (e.g., M.F. Smith 1980b, Steponaitis 1980).

CHAPTER 5

A FUNCTIONAL ANALYSIS OF THE LITHIC ASSEMBLAGES

Introduction

The analysis of lithic data sets from sites 38BK235 and 38BK236 emphasized the functional interpretations of tool kits. Hypotheses and test implications involving artifact level data were designed to complement the differences modeled between the Middle-Late Woodland and Mississippian subsistence-settlement patterns. Particular variables and their attributes reflecting the function of stone tools were isolated, observed, and recorded. On the artifact level, those variables having to do with use/wear patterns on individual use facets (edges, tips, etc.) then received analytical priority. This functional approach not only maximized the available research support by focusing the analysis, but also increased the interpretive potential beyond that of space and time systematics. In this effort, the analysis benefited considerably from a body of existing literature on functional approaches to lithic analysis.

In recent years, the use of a predominantly functional approach in conducting lithic analyses has been slowly replacing the more classic typologically oriented analyses. For the most part, this trend has been a result of various use/wear studies over the past twenty years. Beginning with the study of Semenov (1964), Sonnenfeld (1962), and Keller (1966), investigators have sought to observe edge damage, to define what they were observing, and to attempt to recognize the tool's functions by wear types observed. This trend continued with more emphasis on the manufacture, use, and later observation of wear patterns on experimentally derived stone tools. Within the last three years, in fact, several significant experiments have been conducted by Odell and Odell-Vereecken (1980), Newcomer and Keeley (1979), Keeley (1980), and others in which stone tools were experimentally utilized and then analyzed in blind tests by investigators who did not know their actual use or function. These tests have been moderately successful.

With the increased ability to predict the function(s) of the stone tools by studying use/wear edge damage, the role of lithic analysis in archeological research has become increasingly important. Analytical procedures are now being developed and tested in terms of ascertaining stone tool utilization at the assemblage or site level. Several investigators (Schiffer 1979; Tringham, et al. 1974; Collins 1975; Odell 1980) have attested recently to the value of lithic assemblages in overall site level or regional level behavioral interpretations.

Functional Considerations

An assumption that the use/wear patterns exhibited on tool edges are related to the tool's use(s) in its cultural setting(s) leads to a combination inductive and deductive approach to confirm lawlike generalizations about the uses of stone tools in the past. A finite range of hypothetical patterns and strategies is formulated by induction. Sources of hypotheses include ethnographic and experimental studies, and speculations about the kinds of tools needed for particular tasks.

Based on the environmental, ethnohistorical, and archeological data concerning exploitation strategies in the interior Lower Coastal Plain of South Carolina (Chapter 2), eight general level functional categories were established (Table 24). The categories are expressed here, not in terms of tool types per se, but simply in terms of general functional activities. They were derived from the "mechanics" of the functional activity (scraping, cutting, piercing/perforating, and chopping) and the nature of the material being worked (hard/dense or soft). This technique is becoming more acceptable to lithic analysts (e.g., Odell 1980; Odell and Odell-Vereecken 1980; Tringham et al. 1974; Schiffer 1979).

Odell and Odell-Vereecken (1980), for example, defend using the broad categories of soft, medium, and hard for material being worked by stating "...categories such as 'hard', 'medium', and 'soft' are usually sufficient in answering questions of environmental behavioral import" (Odell and Odell-Vereecken 1980: 89). Finer distinctions have been made. Again, in their work, Odell and Odell-Vereecken (1980: 99-100) define eight separate categories, e.g., motions longitudinal to the working edge, motions transverse to the working edge, grooving, boring, chopping, projectile, abrading, and pounding. Determining whether these or other finer distinctions were possible for categorizing the edges of tools manufactured from the local coarse-grained raw materials would have required an initial microscopic examination of a large number of edges and perhaps some replicative experiments, as well. The project scope of work made it necessary to achieve a balance between characterizing the physical (technological, material, and morphological) and cultural-historical (typological) range of variability in the lithic assemblage and pursuing its more narrowly defined functional aspects. Thus, the categories used here were limited to the functional differences between working hard/dense and soft materials.

A further assumption leads to the separation of functional from formal or stylistic attributes on an analytical level. For several years there has been great controversy over the formal versus the functional approaches to the study of lithic artifacts. Most recent investigators (Ahler 1971; Ahler and McMillan 1976; Odell 1979; Schiffer 1979; Semenov 1964) have stated that form does not necessarily follow function and vice versa (an excellent discussion of the form versus function argument can be found in Tringham et al. 1974). To a great extent, most of the research conducted by these lithic researchers indeed has substantiated this claim. Therefore, each use episode or use edge was treated as a separate analytical unit or "employable unit (EU)," in Knudson's (1979: 270) terms.

TABLE 24

Function	Type Material	Activity
Cutting, hard-dense	bone, antler, hardwood stone (steatite), etc.	butchering, heavy duty processing bone, antler tools, wooden tools, etc.
Soft	soft wood, vegetal matter, meat, etc.	butchering, processing vegetal foodstuffs.
Scraping, hard-dense	bone, antler, hardwood	processing bone, antler tools, spear/arrow shafts, etc.
Soft	hide, fibrous vegetal matter	hide processing, shedding fibrous vegetal matter
Piercing/perforating hard-dense	bone, wood, antler, steatite, etc.	"drilling" or perforating bone antler tools, wooden implements, steatite; engraving wood, bone, antler, etc.
Soft	hide/leather	perforating, decorating engraving, etc.
Chopping, hard-dense	hardwood, bone, antler	felling trees, processing long bone, processing hard vegetal matter, fine wood, wood for "construction," etc.
Soft	soft wood, vegetal matter	processing vegetal matter, firewood, wood for construction

With these assumptions comprising the analytical "backbone," specific hypotheses and their related test implications were then formulated. Hypotheses about the general adaptive strategies utilized by the late prehistoric inhabitants of the Santee riverine zone were derived from Cleland's (1976) focal-diffuse subsistence model and elaborations by Earle (1980) and Christenson (1980) (see Chapter 2). Cleland (1976: 73) classifies Middle-Late Woodland as representing a diffuse economic system, while he classifies Mississippian as focal or "late focal." He also defines expected differences in technological inventories, i.e. tool kits, of the two adaptive strategies. His delineation of tool kits associated with focal and diffuse subsistence strategies serves as a basis for predicting differences between the Middle-Late Woodland and Mississippian lithic assemblages.

The differences between the assemblages fall into three problem domains: (1) tool edge use/wear patterns and single versus multifunctional tool use; (2) lithic raw material utilization; and (3) artifact distributions and intrasite activity (lithic related) patterning. These problem domains, which are discussed below in separate sections, are interrelated.

Use/Wear Patterns

In his discussion of technological variability within focal and diffuse subsistence systems, Cleland (1976: 64) states that he would expect tool kits associated with diffuse economic systems to demonstrate a variety of tool functions, reflecting the greater variety of resources being exploited. He further states that "...this does not necessarily imply an expanded inventory of tool forms or styles...(but that) there is an increase in the variability of tool form paralleling that of function" (Cleland 1976: 64). This should be reflected in the archeological record by the presence of "...tools that perform very diverse functions, as well as a great variety of tool kits" (Cleland 1976: 64).

In contrast, Cleland (1976: 62) expects assemblages associated with focal systems to exhibit limited functional categories. This is not to say that there will be limited variability in tool forms or styles but that there should be "...reduced variability in tool form paralleling limited functional categories" (Cleland 1976: 62). He further explains "...while only a small number of tool kits may be employed, tool production is often prodigious" (Cleland 1976: 62).

Taking this model one step further, Middle-Late Woodland (diffuse) tool kits found in the research area should exhibit relatively few tool types with multiple uses per tool; that is, more use/wear types should be found per tool, thus indicating multiple tool use. Conversely, Mississippian (focal) tool kits should exhibit more specialized single-function tools as reflected in the types of observable use/wear modifications.

For the Cooper River project, single-functional tools were defined as those tools exhibiting only one functional type as reflected in their use/wear patterns while multifunctional tools exhibited two or more distinctive functional types. The single-functional tools may or may not have had only one use edge or use episode, but if they exhibited more than one utilized edge, both were expected to be similar in terms of use/wear patterns. The specialized tools expected to occur in the Mississippian followed the more classic definition of specialized tools, i.e., spur/gravers, perforators, spokeshaves, etc.

The Mississippian assemblage also should show a greater variety of biface forms or styles with tendencies toward functional specificity among each type; i.e., certain style bifaces should be used as butchering or heavy cutting tools while others might be used as projectile points or perforating implements.

Raw Material Utilization

In the study of lithic raw materials from the Cooper River project area, namely the Santee River drainage, the raw material was separated into two categories; local and nonlocal. The division was based on the presence or absence of a particular material in geologic formations on or near the sites. The flaking similarity within and between those materials found locally and those of nonlocal origin was considered. Furthermore, if the raw material was defined as local, the mode of acquisition was assumed to be through primary procurement (local quarrying). If the lithic raw material was nonlocal, however, secondary procurement is implied (exchange/ trade, or "distant" quarrying, whether or not it reflects an embedded strategy).

The locally available raw materials, which would have been immediately accessible for tool manufacture, is represented by two somewhat similar materials: (1) orthoquartzite or silicified sandstone; and (2) poorly cemented, coarse-grained fossiliferous chert. These most probably occur within the Black Mingo Formation which underlies the St. Stephens area (Data Supplement III). It is possible, however, for the chert to be occurring in the Santee limestone which is located to the south of the area.

Orthoquartzite, which was by far the dominant raw material type, is defined as "...a clastic sedimentary rock composed of silica-cemented quartz sand. The cement is commonly deposited in crystallographic continuity with the quartz of the worn grains" (American Geological Institute 1976: 309). The finer, more siliceous the orthoquartzite, the better the conchoidal fracture. The orthoquartzite of the project area varies a great deal in its composition, and therefore, in its desirability as a lithic material for the manufacture of stone tools. Much of the material is poorly cemented with little silica having formed between the sand grains. A minority of the material is cemented well, however, cemented both with pure quartz silica as well as a chalcedonic material of very fine quality. While thought to be a rare occurrence, well-cemented material evidently is not rare in the orthoquartzites of the Santee area (Colquhoun, personal communication).

The nonlocal material represents a wide range of material, all being for the most part, highly siliceous and having similar flint-knapping qualities. The Coastal Plain cherts (occurring in Allendale County, South Carolina, as well as various Georgia locales) and Ridge and Valley cherts (occurring in the Appalachian sedimentary rocks) were probably the finest quality raw material utilized in the project area (Appendix C). Also very highly siliceous meta-igneous lithic materials from the South Carolina and south central North Carolina Piedmont were used. These included rhyolite, tuffs, and silicified argillites (Appendix C). The flaking properties of all these materials are similar.

Due to both their superior flaking properties and their scarcity, the use of highly siliceous, nonlocal raw materials, should be generally limited to the manufacture of formal stone tools, e.g., hafted bifaces, scrapers, perforators, and other specialized tools requiring especially sharp, "fine" working facets (spurs or gravers). The coarser-grained raw material should be used in the manufacture of tools designed for heavy use, e.g., chopping, heavy cutting, and butchering. Both assemblages were expected to exhibit these patterns. However, more nonlocal materials were expected to occur in the Mississippian assemblage because the hypothesized, specialized single-function tools might require finer working edges and because the proportion of nonlocal to local materials may increase due to the proliferation of tools manufactured in a sedentary year-round setting.

Predicting even qualitative differences in the distribution of nonlocal materials between earlier and later period groups is difficult. Certainly the preference for highly siliceous, cryptocrystalline materials and the logistical movement which affected their acquisition played significant roles in the dominant appearance of these materials in Paleo-Indian and Early Archaic tool kits (Goodyear 1979). During the Late Archaic and Woodland periods, mobility and the concomitant territorial range of groups appear to have declined. Direct access to nonlocal material sources may have been hindered. Exchange networks apparently overcame some of these hindrances, but because of intervening economic and social variables, the relationship of raw material to subsistence concerns is less direct. Increasingly social complexity may coincide with the increased movement of nonlocal exchanged materials. In any event, nonlocal materials would have been highly curated because of the expenditure of energy involved in their acquisition, whether by direct acquisition or through exchange.

Artifact Distribution and Activity Areas

Due to the hypothesized seasonality, lower overall population densities, and more dispersed economic activities in the Middle-Late Woodland period, the density of lithic artifacts should be comparatively low (Chapter 2). This would, of course, exclude certain activity areas which might result in high artifact densities due to the nature of the activity (i.e., flint-knapping). The artifacts should show generalized utilization, as discussed earlier, and should occur randomly across the site with no particular patterns in terms of either functional tool types, use/wear patterns, or tasks specialization. The implied randomness is a relative measure. Recent research in Archaic lithic scatters in the South Carolina Piedmont suggests that contemporary activity areas may be distinguished across space (House and Wogaman 1978) and that reoccupation of a site through time may also be spatially circumscribed (Goodyear, House, and Ackerly 1979: 77). As Binford (1980: 17) notes, single events or short-term events can produce very fine-grained patterns in the archeological record, whereas single events and their remains can become blurred in assemblages that accumulate over a long period of time and/or in one place due to lower mobility. Patterns that do emerge in a more coarse-grained assemblage would appear to define areas which have been repeatedly used for specified tasks, specified to the point where the area may be architecturally bounded.

Mississippian sites were expected to be more permanent, have higher population densities and intensive, specialized economic activities, and therefore, to demonstrate greater overall artifact density (Chapter 2). There should be strong associations between functional types and activity areas. Occupation areas or habitation structures should exhibit the widest variety of tools or functional types and the greatest density of artifacts indicative of the intensity of occupation and diversity of activities occurring there. Food-processing areas should show heavily used cutting and chopping tools. Flint-knapping stations should exhibit abundant debitage, broken bifaces, preforms, quarry blades, and cores. Specialized areas should exhibit a variety of tools suitable for the specific tasks. For example, bone- and antler-processing areas should include gravers, spurs, and perhaps spokeshaves, while hide-processing areas should include scrapers and "reamers." Tools may also occur in symbolic, social, or non-utilitarian contexts, for example, in burials.

Summary

Differences between the Middle-Late Woodland and Missippippian lithic assemblages are expected to occur along three interrelated dimensions which reflect subsistence economies. For the comparative analysis, the inventory of Mississippian tools should show a greater number and diversity of tools, more single-function, specialized tools, and a larger number of tools manufactured from nonlocal materials. These tools should be differentially distributed within the Mississippian component at site 38BK235.

Method of Analysis

In composing an analytical scheme to record observations pertinent to the problem domains, five broad categories of lithic artifacts were defined. There were several reasons for this categorization. First, an estimated 70,000 recovered specimens required initial ordering, and all lithic materials could be sorted into these five categories. Secondly the categories have both typological (form) and functional meaning which contribute to complementary sets of analytical observations and thus complementary data for comparisons. Finally, this system can be used to inventory the collection.

The five broad artifact categories established for the analysis are as follows: (1) hafted bifaces/other bifaces; (2) flake tools; (3) cores; (4) debitage; and (5) other lithic artifacts (Table 25). A glossary of terms and definitions may be found in Appendix C.

1. Hafted Bifaces/Other Bifaces: This category encompasses all bifacially manufactured lithic items including all temporally diagnostic hafted bifaces, hafted bifacial tools, nonhafted biface tools, preforms, quarry blades/blanks, and adzes.

2. Flake Tools: Flake tools include all unifacially manufactured/modified artifacts such as scrapers, spokeshaves, denticulates, spur tools/gravers, any specialized tools made on flakes or flake fragments (burins, etc.) and all those "expedient" noncurated flake tools showing little or no intentional modification (i.e. utilized flakes). It should be noted that some of the flake tools

do exhibit bifacial edge retouch but no bifacial manufacture, such as in the case of some flake cutting tools, for instance, denticulates.

3. Cores: Cores are defined as those lithic specimens having had flakes removed for the purpose of the utilization of the flakes and not for the reduction of and/or deliberate use of the specimen itself. In form, these cores range from "chunks" of raw material having had flakes or chips removed to the more classic "exhausted core" form.

4. Debitage: Debitage is defined as "...residual lithic material resulting from tool manufacture" (Crabtree 1972: 58) or, more simply, waste flakes. Note that those flakes or chips showing use facets were removed from the debitage category and included with flake tools.

5. Other Lithic Artifacts: This category includes all ground and polished stone artifacts, hammerstones, manos, metates, abrading stones and any other stone items having "cultural" significance. Few of these artifacts were recovered from the excavation (Chapter 3, Tables 1; 3).

The estimated number of lithic artifacts for these sites was based on extrapolated counts from the catalog sheets. The analyzed artifacts account for approximately 20% of the total. All bifaces, flake tools, cores, and other lithics were analyzed. As might be expected, most of the lithic material falls into the debitage category. Although a detailed analysis of debitage had been planned initially, rescheduling forced a "streamlined" approach to the analysis. All the debitage from site 38BK236 was analyzed, and at site 38BK235, all the debitage from Feature 144AA-BB plus a 20% random, stratified sample based on provenience from Block Excavation Area 1 was analyzed (Chapter 3; Fig. 6).

Derting analyzed the lithic assemblages and recorded the following information: (1) provenience; (2) general morphological/typological forms; (3) raw material; and (4) use/wear patterns (Appendix C). Briefly, the provenience observations include horizontal (grid location) and vertical (level) positioning of the artifacts being analyzed as well as their association with structures, features, etc. The general morphological/typological observations include both descriptive observations, i.e., diagnostic types, description of overall form or shape (when applicable) and, in the case of flake tools, description of type flake (cortical, noncortical) and limited continuous measurements: length, width, thickness, weight (cores only), and overall area (flakes). The raw material observation was simply the visual identification of the material. The use/wear-related observations played the major role in the project's overall functional approach. These observations, including use-edge morphology, use-edge angle, type wear, and location of wear, were conducted only for hafted biface/other biface and flake tools.

TABLE 25

SUMMARY OF TRADITIONAL LITHIC ARTIFACT TYPES
(L = Local, N = Nonlocal)

CATEGORY	38BK235	38BK236
BIFACE*		
Palmer	1 (1L, ON)	
Kirk	2 (1L, 1N)	
Taylor	2 (1L, 1N)	
Stanly	1 (1L, ON)	
Morrow Mountain II	13 (4L, 9N)	1 (1L, ON)
Guilford	10 (10L, ON)	3 (3L, ON)
Savannah River	4 (2L, 2N)	1 (1L, ON)
Otarre	1 (1L, ON)	
Duncan Hanna	5 (5L, ON)	
Swannanoa	8 (8L, ON)	1 (1L, ON)
Yadkin	5 (3L, 2N)	1 (1L, ON)
Santee Stemmed	22 (22L, ON)	1 (1L, ON)
Uwharrie	14 (14L, ON)	
Caraway	35 (33L, 2N)	
Unknown Side or Corner Notched	3 (1L, 2N)	
Unknown Stemmed	23 (17L, 6N)	1 (OL, 1N)
Unknown Triangular	18 (15L, 3N)	1 (1L, ON)
Preforms	141 (137L, 4N)	7 (7L, ON)
Blanks/Quarry Blades	46 (45L, 1N)	2
Unfinished Biface	44 (39L, 5N)	6 (6L, ON)
Perforator-Drill	7 (7L, ON)	
Cutting Tools	21 (15L, 6N)	
Chipped Adze	1 (1L, ON)	
Flesher	1 (1L, ON)	
Unknown Biface	192 (158L, 34N)	3 (1L, 2N)
Subtotal	620	28
FLAKE TOOLS		
Side scraper	7 (7L, ON)	
End scraper	4 (2L, 2N)	
Other scraper	11 (10L, 1N)	
Perforator	2 (2L, ON)	
Spur-Graver	5 (4L, 1N)	
Denticulate	2 (1L, 1N)	
Spokeshave	3 (2L, ON)	
Burin	2 (2L, ON)	
Utilized flake	87 (77L, 10N)	1 (1L, ON)
Unknown	3 (3L, ON)	
	126	1

TABLE 25 (Cont.)

CATEGORY	38BK235	38BK236
CORE		
Unifacial	7	
Bifacial	4	
Multi-facical	6	
Subtotal	17 (13L, 4N)	0
DEBITAGE		
Primary	40 (18L, 22N)	13 (13L, 0N)
Secondary	127 (93L, 34N)	65 (60L, 5N)
Tertiary	670 (577L, 93N)	109 (105L, 4N)
Flakes of Bifacial Retouch	7408 (6831L, 577N)	3720 (3711L, 9N)
Chunks	708 (653L, 55N)	4170 (2576L, 6N)
Subtotal	8953	4170
OTHER		
Mano	1	
Abrading stone	3	1
Atlatl	2	
Bead	1	
Metate/Anvil	1	
Grinding stone	2	
Hammerstone	2	
Groundstone Axe	12	1
Subtotal	12	2
	=========	=========
TOTAL	9728	4201

*Note (See Appendix C)

Archaic: Palmer, Kirk, Taylor, Stanly, Morrow Mountain II, Guilford, Savannah River, Otarre, Duncan/Hanna, Unknown Stemmed, Unknown Side or Corner Notched.

Woodland: Swannanoa, Yadkin

Mississippian: Santee Stemmed, Uwharrie, Caraway, Unknown Triangular

A Functional Study of Bifaces and Flake Tools

As indicated earlier, biface and flake tool use-edges are particularly amenable to functional studies. Consequently, the lithic analysis focused on these tool classes, incorporating use/wear variables (use-edge morphology, use-edge angle, type wear, and location of wear) that have been found useful for inferring tool or tool edge function by other researchers (e.g., Ahler 1979; Hester et al. 1973; Odell 1975, 1979; Odell and Odell-Vereecken 1980; Tringham et al. 1974; Wilmsen 1968; Wylie 1975). The inclusion of all four of these variables in an assemblage level, use/wear study has not been attempted previously.

Use-edge morphology, which parallels Ahler's (1974: 304) edge outline, Tainter's (1979: 465) edge shape, and Keeley's (1980) edge outline shape, refers to the overall shape of the utilized edge or facet viewed in profile at a 90^{o} angle to the edge-on views. This was expressed as being straight, incurvate, excurvate, irregular or, as with distal tips of piercing/perforating tools, acute or obtuse.

Use-edge angle corresponds to Wilmsen's (1968) edge angle, Tringham's et al. (1974: 179) spine angle, and Keeley's (1980: 19) edge angle. Using a modified polar coordinate graph form, the average of three separate edge angle measurements along a given use-edge was recorded.

One of the most difficult tasks in organizing the analysis was establishing the various wear types. Wear types recognized by other investigators were not appropriate for this study because of raw material differences (see Ahler 1979; Hester et al. 1973; Keeley 1979; Odell 1975; Odell and Odell-Vereecken 1980; Tringham et al. 1974). These earlier studies involved fine-grained, highly siliceous cherts, flints, or obsidian, rather than the low silicia, coarse-grained orthoquartzite and silicified sandstone characteristic of the Santee River area. Therefore, it was necessary to define the types of expected wear specifically for this study.

The types of wear defined parallel those of Odell (1975: 229). His "edge scarring" corresponds with our nibbling and edge crushing. Similarly, his "abrasive" forms of edge attrition correspond with our edge deterioration, edge smoothing, and extreme smoothing or "polishing" (Fig. 48; Appendix C). Edge striations were not expected due to the nature of the raw material and the low power of the optical equipment used. This expectation was subsequently confirmed by the analysis.

In order to locate wear traces, all tools were initially scanned with a 10-power hand lens. Those exhibiting use/wear traces were studied in greater detail with an American Optical Corporation Model 570 stereomicroscope (7-42 power) using a direct light source. Scanning with magnifications of 25 to 30X proved most effective. Measures of the type wear variables were based on subjective criteria and recorded as light, medium or heavy wear.

The location of wear traces was recorded as unifacial or bifacial. For flake tools, the surface location of wear (dorsal or ventral) was recorded when determinable.

60X Edge crushing 90X Edge crushing

60X Edge nibbling 90X Edge nibbling

Figure 48. Microscopic magnification of lithic wear types: crushing and nibbling.

60X Edge deterioration

90X Edge deterioration

60X Smoothing/polishing

90X Smoothing/polishing

Figure 48 (cont.). Microscopic magnification of lithic wear types: edge deterioration and smoothing/polishing.

Also included in the use/wear observations were: (1) number of use-edges per tool; and (2) the presence or absence of resharpening. The latter proved to be of little use in this study. The former was used on a very general level to locate the single-functional versus multifunctional tools. However, as will be discussed, the final determination of these tools was accomplished by the computer, after defining the functional types.

Upon completing the recording phase of the analysis, the identification of functional types at the individual use-edge level was accomplished via a computer-assisted, multistage process. During the first stage (previously discussed, Table 24) eight functional type categories were established, based on the general types of stone tool use as indicated by environmental-ecological (i.e., resource availability and utilization, Chapter 2), ethno-archeological (see Gould et al. 1971; Hayden 1977; Kamminga 1977) and experimental (Keeley 1980; Odell and Odell-Vereecken 1980) data. Each functional category was expected to represent distinctive use/wear patterning.

The second stage involved subdividing the eight functional categories according to (1) local or coarse-grained, poorly siliceous materials and (2) nonlocal or fine-grained, highly siliceous materials. This resulted in 16 categories (see Table 26). This stage was necessary because of the wide range of variability in lithic raw materials. Although the vast majority (89%) of the formal utilized tools were of orthoquartzite, 10% were of nonlocal, highly siliceous materials. It was expected that wear patterning exhibited by highly siliceous raw materials would be quite different and analytically more distinct.

During stage three, expected use/wear patterns were formulated for each of the 16 categories. These were expressed as absolute expectations or as a range of variation, depending upon the particular use/wear edge variable (see Table 26). Once the expected and mutually exclusive use/wear patterns were formulated, the computer was programmed to select only those use-edges meeting <u>all</u> the expected criteria for each of the functional categories. From the use-edges identified as to functional category, it was then possible to isolate multifunctional tools. For purposes of comparison, the remainder was assumed to be single-functional tools.

While many biface and flake tool use-edges did not "clear the sytem," it is reasonably certain that those which did "clear the system" are the "ideal" or "modal" types for their respective functional categories. The strictures built into the system are no doubt responsible for culling out use-edges that, in reality, should have fallen into the various functional categories, but were not selected because they exceeded the range of variation specified for one or more of the use/wear variables.

Finally, by means of an examination of the spatial distribution of temporally diagnostic artifacts, including bifaces, CALFORM maps (White and Sexton 1981) were used to identify roughly contemporaneous activity areas. Their functional variability was examined, then, in part, by a spatial comparison of their respective, functionally defined biface and flake tool assemblages. This phase of the lithic analysis was conducted only for Block Excavation Areas 1 and 4 at 38BK235 (Chapter 3). For comparative

TABLE 26

EXPECTED USE/WEAR PATTERNS

Data Set	Raw Material: Local (01, 04)	Raw Material: Nonlocal (02, 03, 06, 07, 08, 09, 10, 13)
Hafted Bifaces/Other Bifaces Category I (cutting, hard-dense)		
1. Location of wear	4	4
2. Use-edge angle	30°-60° (inclusive)	20°-45° (inclusive)
3. Type wear	06, 07, 09, 10, 13	03, 04, 06, 07
4. Use-edge morphology	1, 2	1, 2
Hafted Bifaces/Other Bifaces Category II (cutting, soft)		
1. Location of wear	4 (3)	4 (3)
2. Use-edge angle	20°-50° (inclusive)	20°-40° (inclusive)
3. Type wear	11, 12, 14, 15	11, 12, 14, 15
4. Use-edge morphology	1, 2	1, 2
Flake Tools Category III (scraping, hard-dense)		
1. Location of wear	1, 2, 4 (single edge)	1, 2, 4 (single edge)
2. Use-edge angle	60°-90° (inclusive)	69°-90° (inclusive)
3. Type wear	03, 04, 06, 07, 10	03, 04, 05, 06, 12, 13
4. Use-edge morphology	1, 2, 3 (spokeshave)	1, 2, 3 (spokeshave)
Flake Tools Category IV (scraping, soft)		
1. Location of wear	1, 2, 4 (single edge)	1, 2, 4 (single edge)
2. Use-edge angle	50°-80° (inclusive)	50°-80° (inclusive)
3. Type wear	02, 03, 11, 12, 13, 14, 15, 16	02, 13, 11, 12, 14, 15
4. Use-edge morphology	1, 2, 3, (spokeshave)	1, 2, 3, (spokeshave)

TABLE 26 (Cont.)

Data Set	Raw Material Local (01, 04)	Raw Material Nonlocal (02, 03, 06, 07, 08, 09, 10, 13)
Hafted Bifaces/Other Bifaces Category V (piercing/perforating, hard-dense)		
1. Use-edge morphology	5, 6	5, 6
2. Use-edge angle	15°-45° (inclusive)	15°-45° (inclusive)
3. Type wear	03, 04, 06, 07, 09, 10	03, 04, 05, 06, 07, 12, 13
4. Location wear	4	4
Hafted Bifaces/Other Bifaces Category VI (piercing/perforating, soft)		
1. Use-edge morphology	5, 6	5, 6
2. Use-edge angle	15°-35° (inclusive)	15°-35° (inclusive)
3. Type wear	02, 08, 11, 12	02, 11, 12
4. Location of wear	4	4
Hafted Bifaces/Other Bifaces Category VII (chopping, hard-dense)		
1. Type wear	06, 07, 09, 10	03, 05, 06 12, 13
2. Location of wear	4	4
3. Use-edge angle	45°-90° (inclusive)	45°-90° (inclusive)
4. Use-edge morphology	1, 2, 4	1, 2, 4
Flake Tools Category VIII (chopping, soft)		
1. Type wear	05, 06, 08,09	03, 04, 05, 06
2. Location of wear	4	4
3. Use-edge angle	40°-70° (inclusive)	40°-70° (inclusive)
4. Use-edge morphology	1, 2, 4,	1, 2, 4,

Notes:
(1) Expectations are based on the reference cited in the text and the author's personal knowledge of lithic raw material properties.
(2) Explanations of the number codes may be found in Appendix C.

purposes, only these excavation areas contained sufficient numbers of bifaces and flake tools that, based on various lines of evidence (see Chapters 3 and 4), were probably contemporaneous. Because of the small number of bifaces and flake tools (n = 29), no computer mapping of lithic assemblages was conducted for 38BK236.

The Biface Assemblage

The following discussion of the biface assemblage data from 38BK235 and 38BK236 emphasizes the tool/use-edge functional categories as they relate to "temporally diagnostic" bifaces as illustrated in Figures 49-51. Detailed biface definitions (based on temporal and techno-functional criteria) and tabulations of biface data sets (provenience, morphological/typological, raw material, and use/wear) may be found in Appendix C and Data Supplement VII.

A total of 620 bifaces was recovered from 38BK235 during Phase I and Phase II investigations (Chapter 3). Of this total, evidence of use/wear was detected on only 180 bifaces, with 75 exhibiting use/wear on one edge, 100 on two edges, and 5 on three edges. The number of utilized biface edges that were identified as to functional category was 132, or 45.5%, of the total use-edges. Forty-seven tools were multifunctional.

Table 27 and Figure 52 show the 38BK235 biface frequencies by functional category. First, it should be noted that most of the bifaces in chopping categories 7 and 8 should be placed in cutting categories 1 and 2, according to their respective raw material and material processed classifications. The chopping functions for the preforms, the flesher, the nonhafted cutting tools, and the unknown biface tools are probably correct and should stand as they are. Although there were virtually no bifacial chopping tools, a number of bifaces were misclassified as choppers, largely because their edges were recorded as having heavy nibbling. In retrospect, this problem could have been avoided, for example, by quantifying nibbling as to depth. That is, chopping tools should have much deeper nibbling scars than cutting tools.

Of the 132 functionally identified biface edges from 38BK235, 37 (38.0%) are in category L-1 (local raw material--cutting, hard/dense), 63 (47.7%) are in L-2 (local raw material--cutting, soft), 6 (4.5%) are in L-7 (local raw material--chopping hard/dense), 8 (6.0%) are in L-8 (local raw material--chopping, soft), 17 (12.9%) are in N-1 (nonlocal raw material--cutting, hard/dense) and 1 (.8%) in N-2 (nonlocal raw material--cutting, soft). It was expected that most bifacial tools would be used for cutting or piercing/perforating functions. The apparent absence of piercing/perforating bifaces is probably attributable to little or no wear accrual during use, making it difficult to detect analytically.

The data presented in Table 27 further indicate that (1) the bifaces from 38BK235 are largely of local raw material (orthoquartzite--86.4%); (2) soft materials were processed only slightly more frequently than hard/dense materials (54-55% vs. 45-46%); and (3) bifaces of local raw material have a greater tendency to have been used for cutting soft materials, whereas

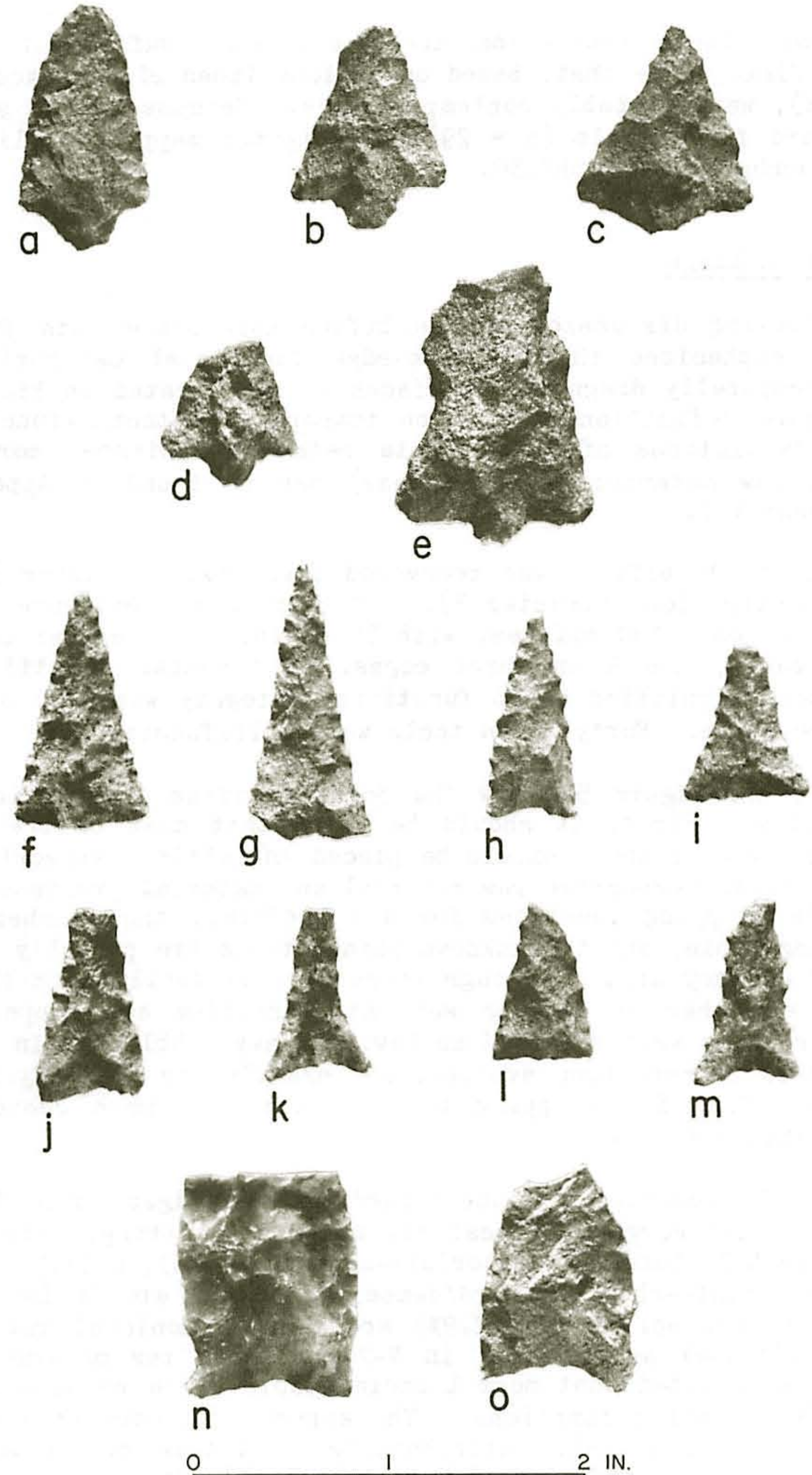


Figure 49. (38BK235) A-C - Santee stemmed; D - unfinished Santee stemmed; E - Santee stemmed; F-G - Uwharrie-like triangular; H - serrated triangular biface; I - Caraway triangular; J-L - Caraway triangular biface; M - serrated Caraway triangular biface; N-O - Yadkin-eared. *A-M, O are of orthoquartzite, N - chert.

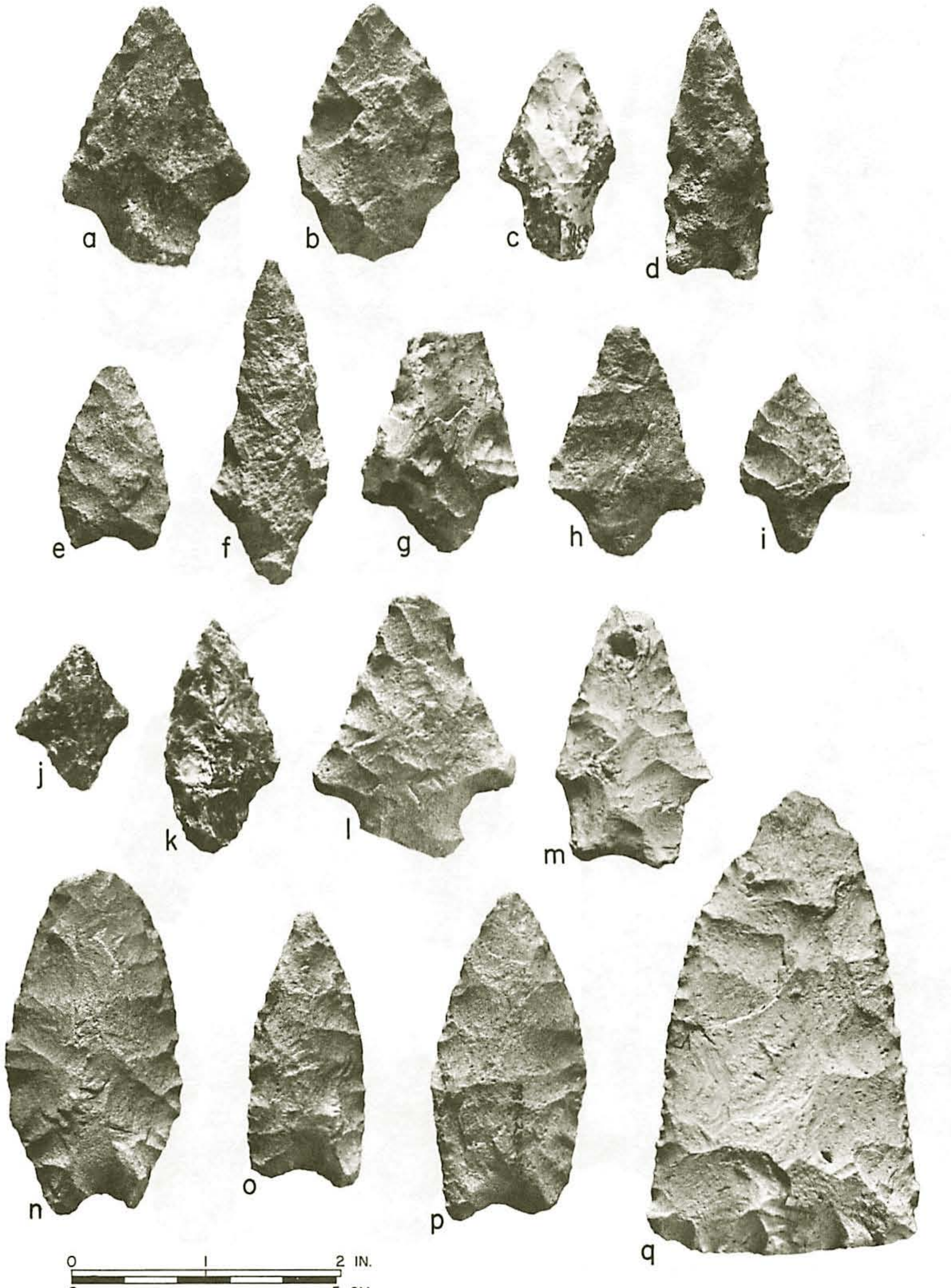


Figure 50. (38BK235) A - Woodland Stemmed (probably Otarre); B - Swannanoa; C - "Bare Island-Poplar Island"-like; D - Duncan-Hanna; E - Well-made lanceolate (Guilford?); F-G - Morrow Mountain II; H - Otarre; I-K - Morrow Mountain II; L - Stanley; M - Kirk Stemmed; N-P - Well-made lanceolate (Guilford?); Q - Preform, Early Archaic in form (A, B, D, E, F, H, L, N-P - orthoquartzite; C, G, I, M, Q - Coastal Plain chert; J, K - black, fossiliferous chert).

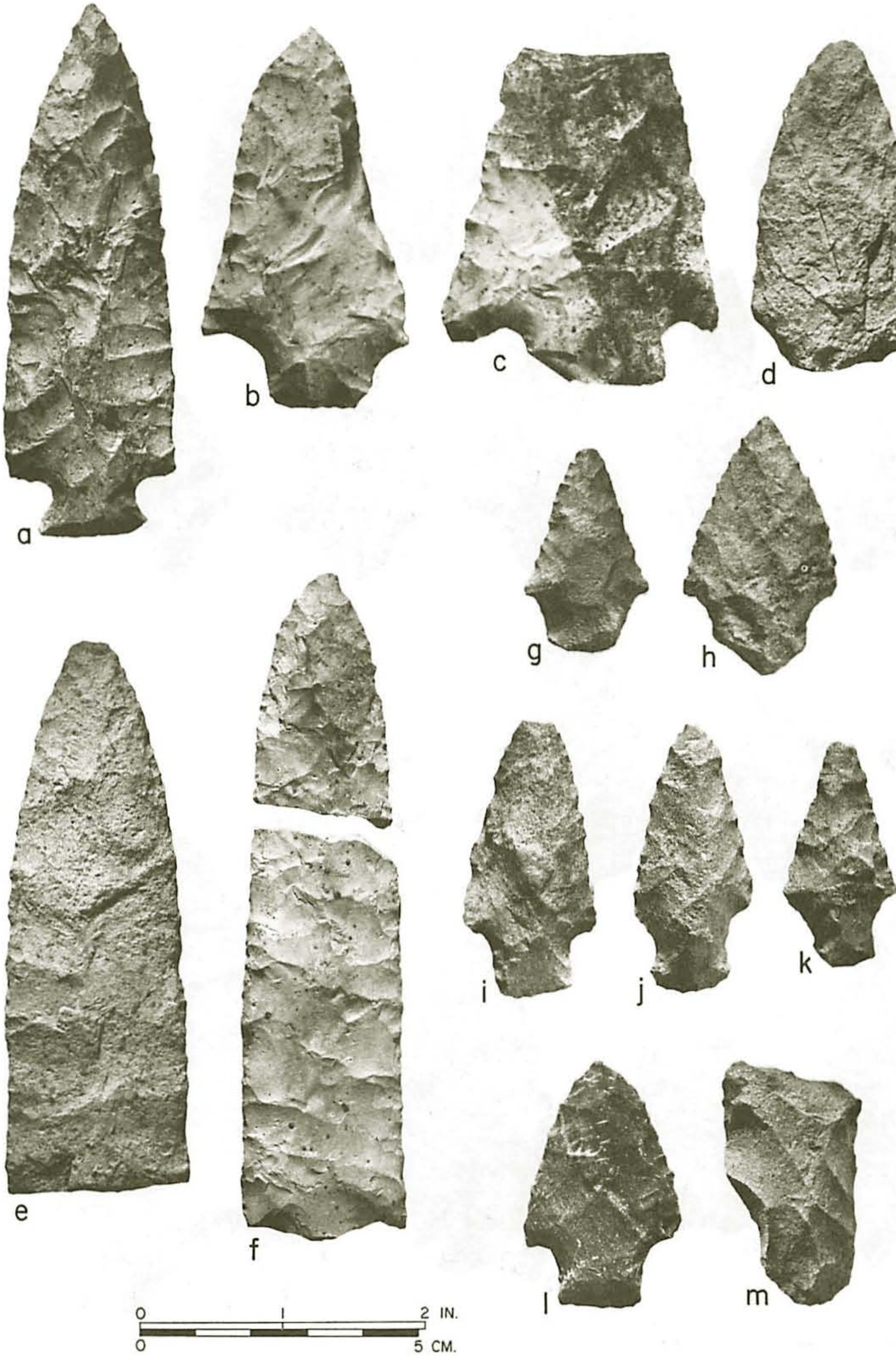


Figure 51. (38BK235) A - Unknown corner notched biface (Palmer?); B - Kirk Stemmed; C - Kirk corner notched; D-F - blade of broken biface; G-H - Swannanoa; I-K - Dustin/Lamoka-like biface; L - Unknown Late Archaic-Early Woodland Stemmed; M - Unknown biface (preform?). (G, H, I, J, K, and M are orthoquartzite; B, C are Coastal Plain chert; A, D, F are finely porphyritic rhyolite; E, L are flow banded rhyolite.)

TABLE 27

BIFACES - SITE 38BK235

	Cut Hard/Dense L-1	Cut Soft L-2	Scrap Hard/Dense L-3	Scrap Soft L-4	Pierc/Perf. Hard/Dense L-5	Pierc/Perf. Soft L-6	Chop Hard/Dense L-7	Chop Soft L-8	Cut Hard/Dense N-1	Cut Soft N-2	Scrap Hard/Dense N-3	Scrap Soft N-4	Pierc/Perf. Hard/Dense N-5	Pierc/Perf. Soft N-6	Chop Hard/Dense N-7	Chop Soft N-8	Total
Taylor								1							1		2
Palmer		1															1
Kirk Corner-notched										1							1
Unknown side-notched																	0
Unknown Corner-notched															1		1
Kirk Stemmed																	0
Stanly																	0
Santee Stemmed		6					2	2									10
Morrow Mountain II															3		3
Savannah River		1					1								2		4
Swannanoa	1	2					1	1									5
Otarre																	0
Unknown Stemmed	2	3					2	2							3		12
Guilford	1	3					1	1									6
Duncan-Hanna	1						1	1									3
Yadkin		1															1
Uwharrie		3						2									5
Caraway		3						1									4
Unknown Triangular	1	2					1	2							1		7
Blank-Quarry Blade	1																1
Preform	2	3					1	1									7
Perforator/Drill		1															1
Flesher							1										1
Chipped Adze	1																1
Non-Hafted Cutting Tool	4	2					4	2									12
Unknown Bifacial Tool	9	2						5									16
Unknown Biface		12					4								4		20
Hafted Cutting Tool								1							2		3
Unfinished Biface		3					1	1									5
TOTAL	23	48	0	0	0	0	20	23	0	1	0	0	0	0	17	0	152

L = Local L.R.M.
N = Nonlocal L.R.M.

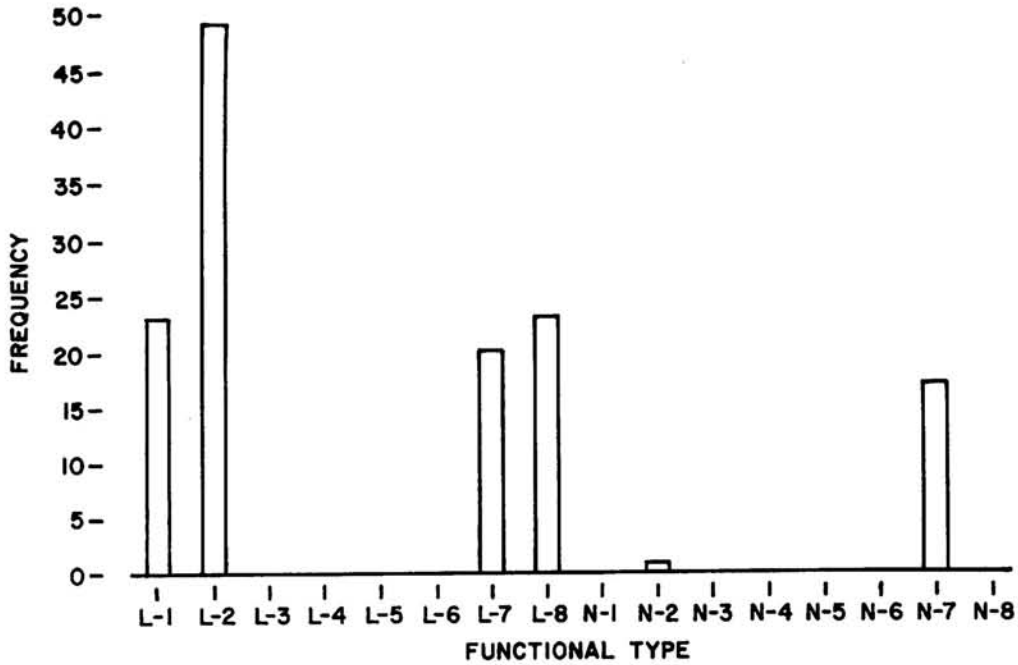


Figure 52: (38BK235) Hafted Bifaces/Other Bifaces (functional types).

bifaces of the nonlocal, highly siliceous raw materials were used almost exclusively for cutting hard/dense materials.

That most bifaces would be made of the local raw materials was expected. That soft materials (plant and animal tissue) directly related to subsistence were apparently processed more frequently than hard/dense materials (wood and bone) is not surprising. What is surprising, however, is that bifaces of highly siliceous, nonlocal raw materials would have been used most frequently for processing hard/dense materials and, conversely, that bifaces of orthoquartzite would be used primarily for processing soft materials.

While there are a number of potential, alternative explanations for this apparent discrepancy, tools of highly siliceous raw materials tend to have more fragile edges, and thus, may be more susceptible to use/wear damage, even from processing relatively soft materials (Crabtree 1972; Tringham et al. 1974). Further, because bifaces of nonlocal, siliceous materials are more likely to be curated and intensively utilized (Goodyear 1979), they are also more likely to exhibit heavier edge damage that could be erroneously interpreted as resulting from processing hard/dense materials. Conversely, bifaces of the coarser-grained orthoquartzite are not as susceptible to wear/edge damage, and especially if more expediently utilized, could be interpreted incorrectly as used for processing soft rather than hard/dense materials.

An examination of the 38BK235 bifaces (Table 27) in terms of functional category by names or "temporally diagnostic" types indicates that most, if not all, of the bifaces of nonlocal material are those that are generally attributed to the Archaic Period (Taylor, Kirk corner-notched, Unknown corner-notched, Morrow Mountain II, Savannah River, Unknown Stemmed).. This may be accounted for by Goodyear's (1979) model of hunter-gatherer mobility for the Paleo-Indian and Archaic periods, during which the use of highly siliceous, cryptocrystalline materials was emphasized.

Bifaces generally attributable to the Woodland (Swannanoa--Keel 1976; Yadkin--Coe 1964) and Mississippian (Uhwarrie and Caraway--Coe 1964; Santee Stemmed--Appendix C) periods, however, are all of the local orthoquartzite. It was expected that nonlocal raw materials would be represented, especially in the Mississippian assemblage. This discrepancy may be due to a number of factors: (1) sample bias, (2) present inability adequately to identify or distinguish diagnostic bifaces, or (3) Woodland and Mississippian populations being more localized and self-sufficient than thought.

From a functional perspective, the Woodland bifaces are more equally divided between cutting, hard/dense (2--33%), and cutting, soft (4--67%), possibly indicative of the hypothesized generalized subsistence strategy. The Mississippian bifaces, on the other hand, indicate use almost exclusively as cutting tools for processing soft materials (17 of 19 bifaces--89.5%), possibly indicative of a more focal or specialized subsistence strategy.

The number of total bifaces recovered from 38BK236 during Phase I and II investigations was 28 (Fig. 53; see Chapter 3). Of this total, evidence of use/wear was detected on only 9 bifaces, with 1 exhibiting use/wear on one edge, 7 on two edges, and 1 on three edges. The number of utilized biface edges was reduced further to 7 (38.9%) that were identified as to functional category. One multifunctional tool was identified.

Table 28 and Figure 54 show the biface frequencies for 38BK236 by functional category. After correcting for the chopping/cutting problem, already discussed, 5 bifaces (71.4%) are in category L-1 (local raw material--cutting, hard/dense), 1 (14.3%) in category L-5 (local raw material--piercing/perforating, hard/dense) and 1 (14.3%) in category N-1 (nonlocal raw material--cutting, hard/dense). As expected, the bifaces are largely of local raw material and seem to relate to cutting or piercing/perforating functions. Unlike 38BK235, the bifaces from 38BK236 suggest a strong emphasis on processing hard/dense materials (bone or wood). However, with such a small sample size (n=7), inferences for 38BK236 regarding biface function and raw material selection should be made with extreme caution. Similarly, from a temporal perspective, all that can be reasonably inferred from the biface data is that 38BK236 appears to have been utilized during the Middle to Late Archaic and Woodland periods.

The Flake Tool Assemblage

The flake tool assemblage data from 38BK235 and 38BK236 emphasize the tool/use-edge functional categories. A number of the more distinctive (formal) flake tools are illustrated in Figure 55. Detailed flake tool definitions (based on form and techno-functional criteria) and computer tabulations may be found in Appendix C and Data Supplement VII.

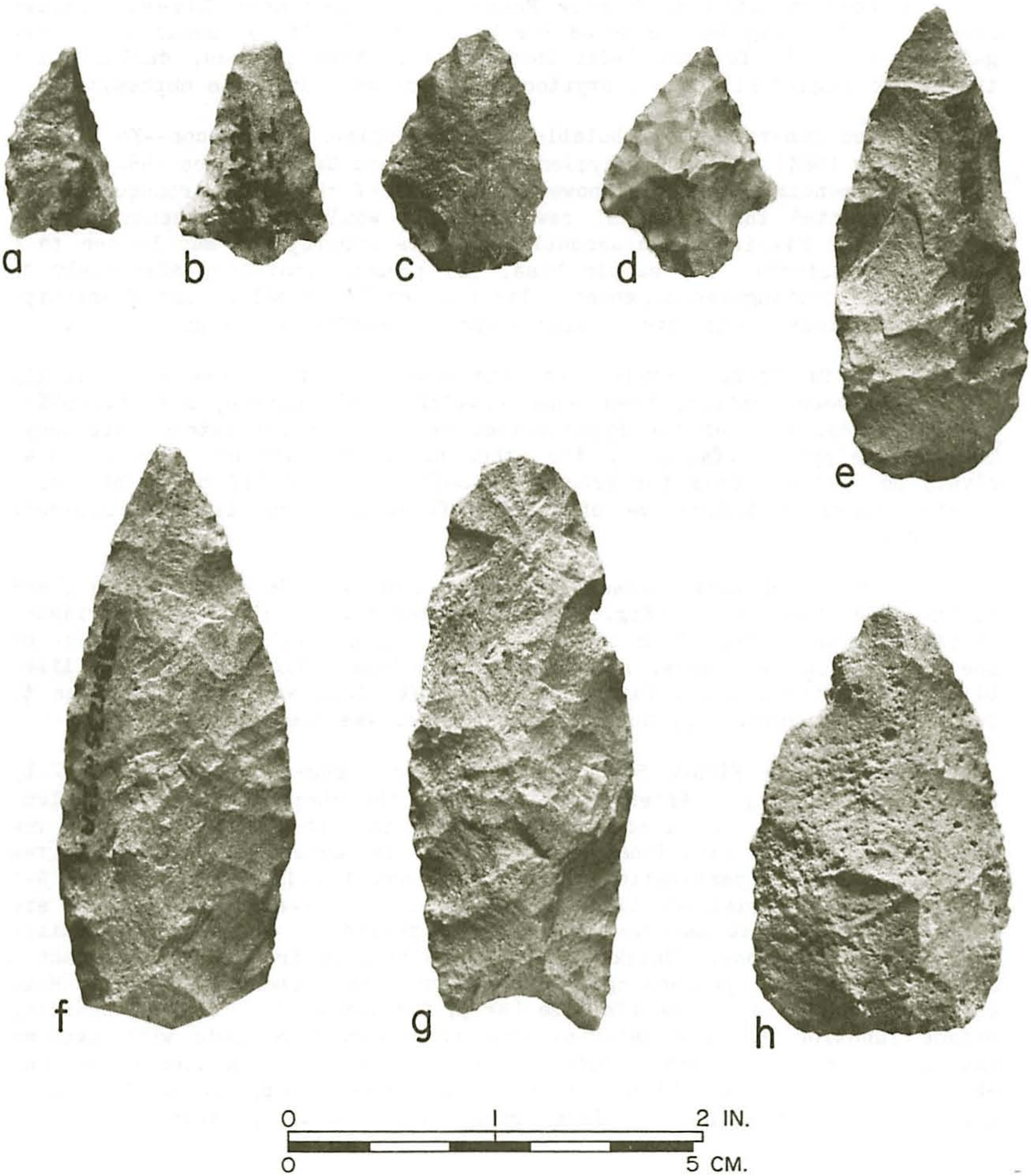


Figure 53: (38BK236) A - Resharpened Caraway; B - Santee stemmed; C - Swannanoa; D - Morrow Mountain II; E - Guilford; F - probable Guilford; G - Well-made lanceolate (Guilford?); H - Preform; (A-C, E-H - orthoquartzite; D - Coastal Plain Chert).

TABLE 28

BIFACES - SITE 38BK236

	Cut Hard/Dense L-1	Cut Soft L-2	Scrap Hard/Dense L-3	Scrap Soft L-4	Pierc/Perf. Hard/Dense L-5	Pierc/Perf. Soft L-6	Chop Hard/Dense L-7	Chop Soft L-8	Cut Hard/Dense N-1	Cut Soft N-2	Scrap Hard/Dense N-3	Scrap Soft N-4	Pierc/Perf. Hard/Dense N-5	Pierc/Perf. Soft N-6	Chop Hard/Dense N-7	Chop Soft N-8	Total
Morrow Mountain II							1										1
Savannah River	1																1
Unknown Stemmed	1														1		2
Yadkin					1												1
Preform							2										2
TOTALS	2	0	0	0	1	0	3	0	0	0	0	0	0	0	1	0	7

L = Local L.R.M.
N = Nonlocal L.R.M.

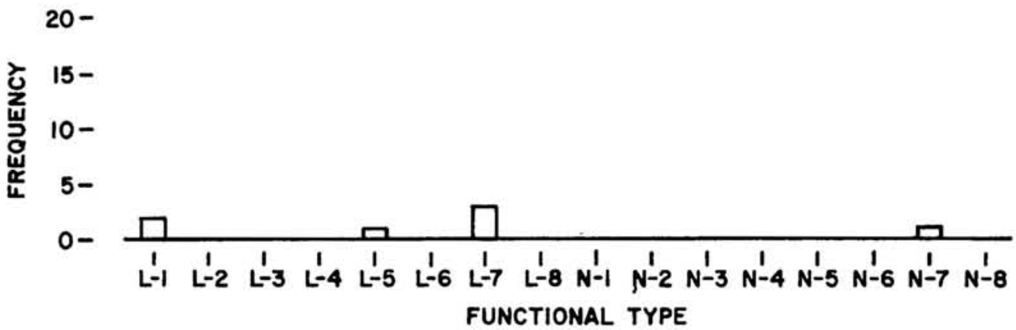


Figure 54. (38BK236) Hafted bifaces/other bifaces (Functional Types).

All but one of the flake tools (formal tools and utilized flakes) were recovered from 38BK235 during Phase I and II investigations (Fig. 55; Chapter 3). Of these 126 flakes, evidence of use/wear was detected on 124 exhibiting use/wear on one edge, 16 on two edges, and 4 on three edges. The number of flake tool edges that were identified as to functional category was reduced to 43 (25.6%). Twelve tools were multifunctional.

Table 29 and Figure 56 show the frequencies of flake tool edges from 38BK235 by functional category. Of the 43 edges identified as to functional category, 1 (2.3%) is in category L-1 (local raw material--cutting, hard/dense), 16 (37.2%) are in category L-3 (local raw material--scraping, hard/dense), 18 (41.9%) are in category L-4 (local raw-material--scraping, soft), 3 (7.0%) are in category N-3 (nonlocal raw material--scraping, hard/dense), and 5 (11.6%) are in category N-4 (nonlocal raw material--scraping, soft).

As indicated by Table 29, function as suggested by form (e.g., side scraper) corresponds remarkably well with function as indicated by use/wear criteria. While it was expected that flake tools would be used for scraping or cutting functions, it was not expected that only one (4%) of the 25 utilized flakes would indicate a cutting function and the other 24 (96%) a scraping function. Ordinarily, scraping tools might be expected to be shaped formally (e.g., Wilmsen 1968; Tringham et al. 1974), rather than expediently formed (i.e., utilized flakes). Nevertheless, based on Table 29, it would appear that there was a strong tendency for both formal and utilized flake tools at 38BK235 to be used in scraping functions, presumably complementing the cutting functions of the bifaces.

In terms of materials processed, the flake tools used in scraping functions appear to be about equally divided between use on hard/dense (19--45.3%) and soft materials (23--54.7%). Again, as with the bifaces from 38BK235, there is a slight emphasis on processing soft materials (plant and animal tissue), presumably indicating an emphasis on activities

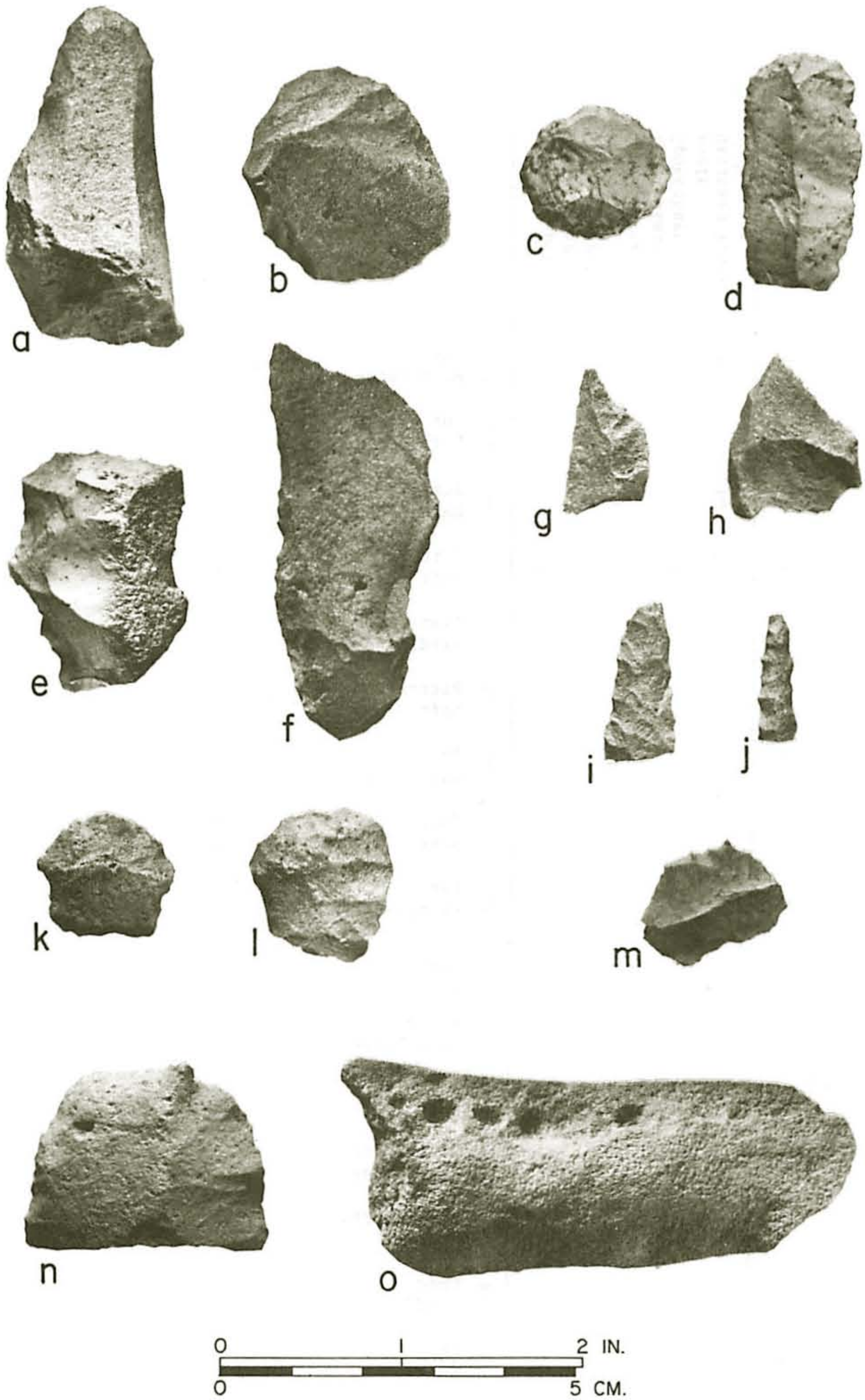


Figure 55. (38BK235) A - endscraper on "chunky" blade; B - ovate scraper; C - ovate "thumbnail" scraper; D - steep-edged endscraper on blade; E - combination endscraper, spur tool and spokeshave; F - combination spur tool/side scraper; G-H - flake spur tool; I-J - tip of perforator/drill; K-L - "flesher"/fleshing tool; M - "mini-spur" tool/ graver; N - multifunction tool (left side scraper, right side knife, distal tip graver); O - flake cutting tool. (A, B, F-L, N, O - orthoquartzite; C, D, E, M - Coastal Plain Chert).

TABLE 29

FLAKE TOOLS - SITE 38BK235

	Cut Hard/Dense L-1	Cut Soft L-2	Scrap Hard/Dense L-3	Scrap Soft L-4	Pierc/Perf. Hard/Dense L-5	Pierc/Perf. Soft L-6	Chop Hard/Dense L-7	Chop Soft L-8	Cut Hard/Dense N-1	Cut Soft N-2	Scrap Hard/Dense N-3	Scrap Soft N-4	Pierc/Perf. Hard/Dense N-5	Pierc/Perf. Soft N-6	Chop Hard/Dense N-7	Chop Soft N-8	Total
Side Scraper				3													3
End Scraper											1	1					2
Other Scraper			5	3								1					9
Perforator																	0
Spur-Graver																	0
Denticulate																	0
Spokeshave			1	1							1	1					4
Burin																	0
Utilized Flake	1		10	11							1	2					25
TOTAL	1	0	16	18	0	0	0	0	0	0	3	5	0	0	0	0	43

L = Local L.R.M.
N = Nonlocal L.R.M.

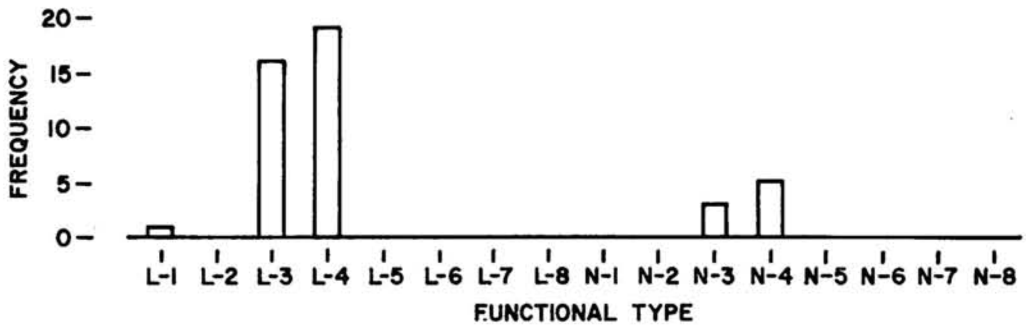


Figure 56: (38BK235) Flake tools (functional types).

relating directly to subsistence items. Unlike the bifaces, flake tools of both local and nonlocal material were used on soft materials.

With respect to flake tool and raw material correlations, Table 29 indicates a relatively high frequency of flake tools of nonlocal material (5 formal tools and 3 utilized flakes--18.6%--of the flake tool assemblage). A tendency to obtain and curate highly siliceous raw materials for specialized flake tools (spokeshaves and various scrapers) may be indicated.

Finally, only 1 flake tool, a utilized flake of orthoquartzite with 1 use-edge, was recovered from 38BK236 during Phase I and II investigations (see Chapter 3). While the flake was not identified as to functional category, use/wear attributes (excurvate use-edge, 45° use-edge angle, medium nibbling, use/wear on dorsal surface) suggest a scraping function.

Comparative Distribution

In terms of temporal comparisons of spatial/functional variability, there are too few bifaces and flake tools from 38BK236 (predominantly Middle-Late Woodland) for reliable comparisons with 38BK235 (predominantly Mississippian). Similarly, while there is a fairly high frequency of typologically Middle-Late Woodland bifaces from 38BK235 (see Tables 1, 3, and 27; Figs. 49-51), particularly in Block Excavation Area 1 (see Chapter 3), the ceramic and biface data suggest a primarily Mississippian context, making any spatial/functional comparisons between Middle-Late Woodland and Mississippian components at 38BK235 highly suspect. Consequently, comparisons of the biface and flake tool assemblage are limited to Mississippian intrasite spatial/functional variability at 38BK235.

The biface and flake tool assemblages from Block Excavations 1 (Feature 7 and vicinity--Mississippian structure and associated features) and 4 (Feature 14AA-BB and vicinity--probably a Mississippian structure and associated bone/burial pit) will be considered (see Chapter 3 for a discussion of Features 7 and 14). Only Block Excavation Areas 1 and 4 have sufficiently large biface and flake tool assemblages of probable Mississippian origin to make comparisons of spatial/functional variability feasible. First, however, it must be reasonably established that Features 7 and 14 are essentially contemporaneous and, therefore, that the variability that exists between the two areas is of a functional nature.

Because attempts to establish the contemporaneity of Features 7 and 14 via radiometric dating were unsuccessful, arguments for contemporaneity must be based on other lines of evidence (Chapter 3). Based primarily on traditional ceramic and lithic artifact typologies, Feature 7 and most other features in Block Excavation Area 1 are Mississippian (see Chapters 3 and 4).

The evidence of Feature 14AA-BB being Mississippian is not as clearcut. While typologically Mississippian ceramics and bifaces do occur in Feature 14AA-BB, most of the identifiable analyzed ceramics are generally considered to be Woodland and the lithic artifacts Late Archaic. Even those two lines of artifactual data are not in agreement. However, for whatever reason, typologically early artifacts are common in at least some Mississippian contexts (e.g., Willey 1949). In conjunction with no evidence of disturbance, the limited knowledge of "temporally diagnostic" artifacts and the presence of at least some typologically Mississippian artifacts suggest a Mississippian time period for Feature 14AA-BB.

One of the strongest arguments for the contemporaneity of Features 7 and 14AA-BB is the similar content, treatment, and preservation of the human and animal bone associated with the respective features (Chapters 3 and 6). Therefore, based on the various lines of data presented, it is suggested that Features 7 and 14AA-BB are essentially contemporaneous and that the variability between them is functional.

That the two features are functionally different is not surprising when one considers the apparent "burial" context of Feature 14AA-BB, as opposed to an apparent "domestic" context for Feature 7. Within a burial context, we would expect a very different artifact assemblage, whether the artifacts represent grave goods and/or activities involved in burial preparation.

Feature 7

From an examination of the spatial distribution of the biface and flake tool assemblages in Block Excavation Area 1, it is immediately obvious that the densest concentrations of these artifacts, regardless of analytical breakdown, are in and around the Mississippian features. While there is notable spatial variability according to the specific analytical breakdown, only the general patterns will be summarized (for detailed spatial data, compare Figures 7 and 10 and the lithic artifact CALFORM Figures 57 to 67).

In relation to Feature 7, the densest concentrations are around the edges and the central interior of the structure, usually extending from around the hearth (Feature 1), toward a probable entryway at the southwestern edge, and out into the general area in "front" (south) of the

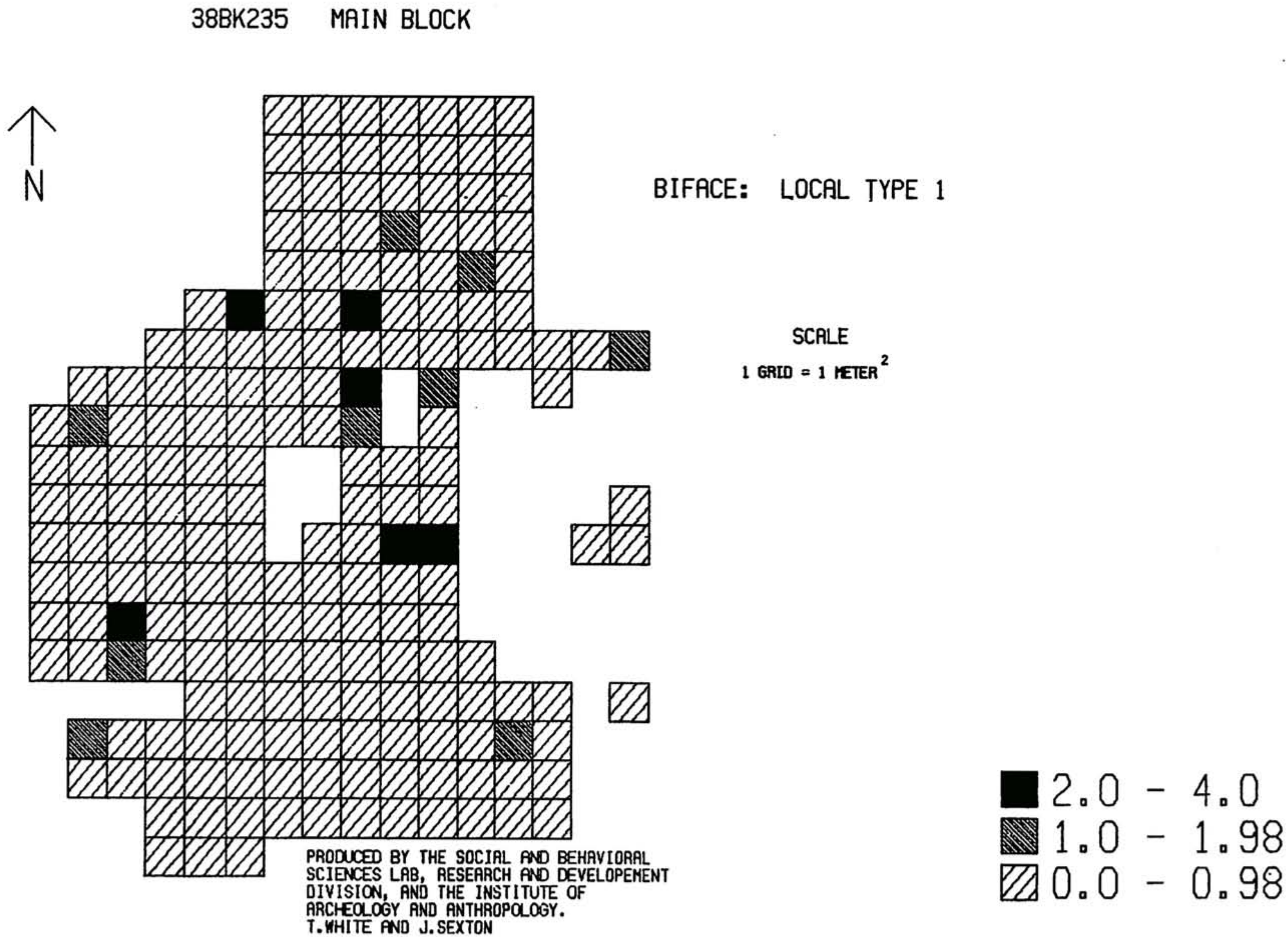


Figure 57. Spatial distribution of bifaces (Local Type 1).

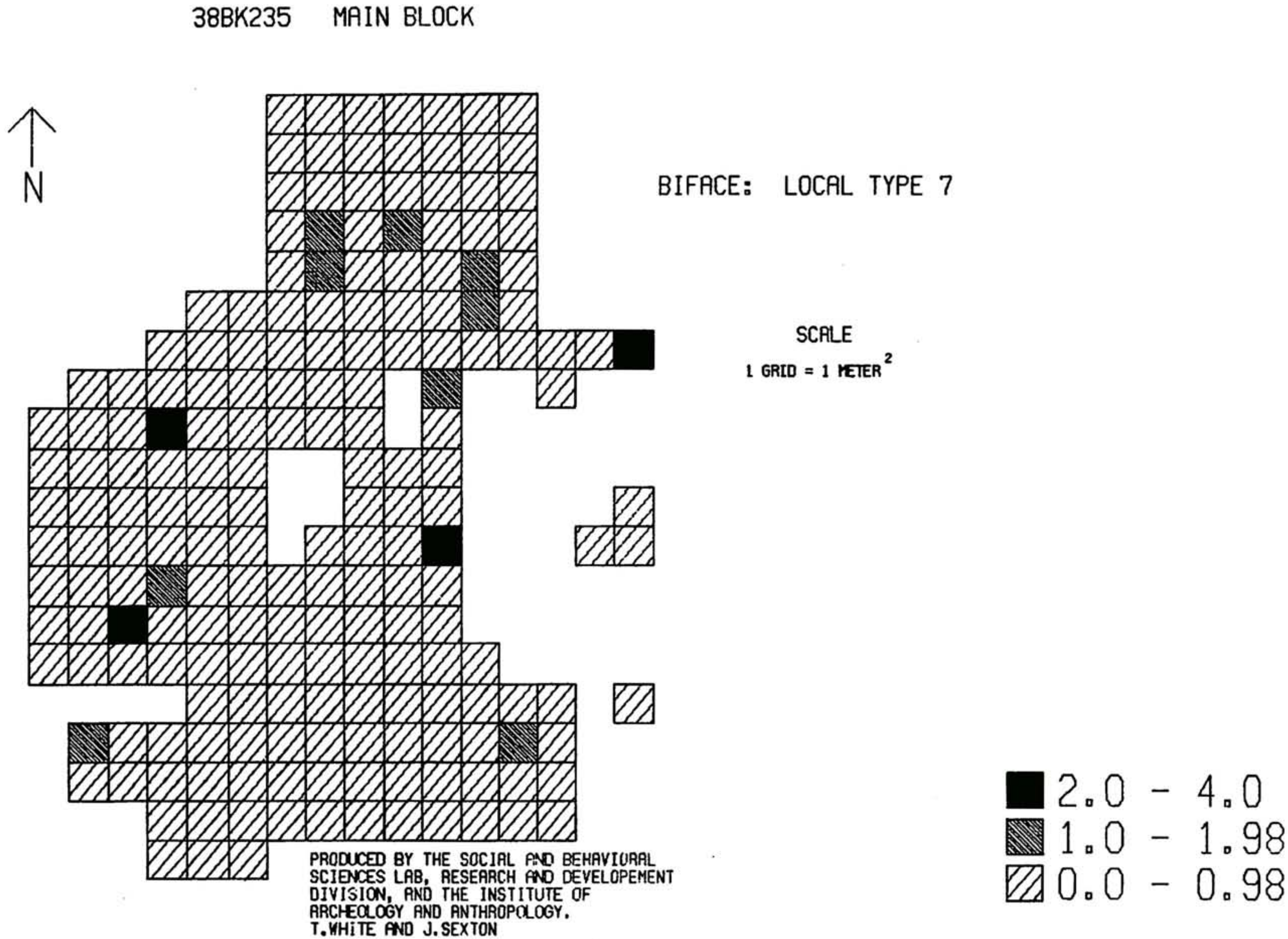


Figure 58. Spatial distribution of bifaces (Local Type 7).

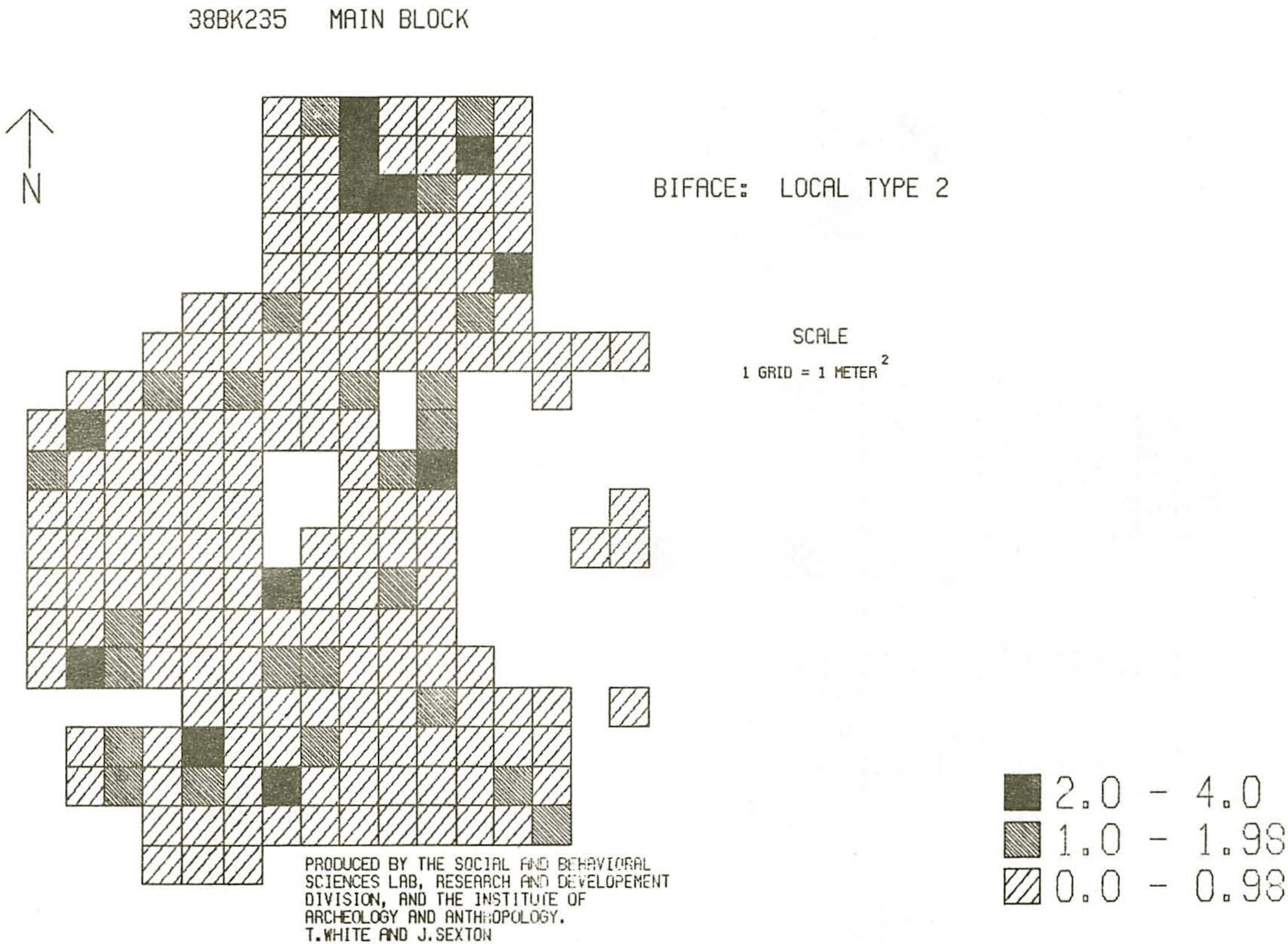


Figure 59. Spatial distribution of bifaces (Local Type 2).

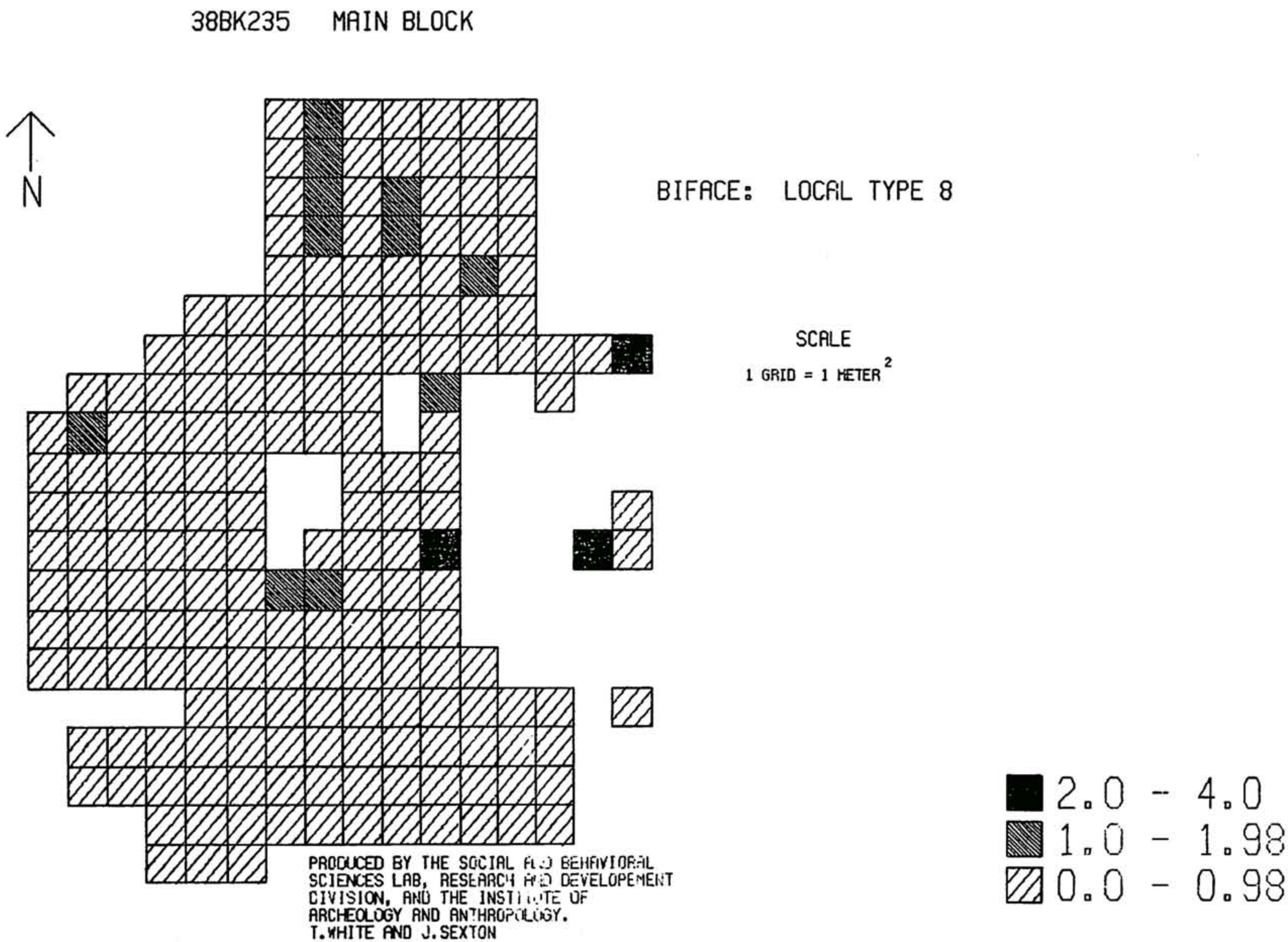


Figure 60. Spatial distribution of bifaces (Local Type 8).

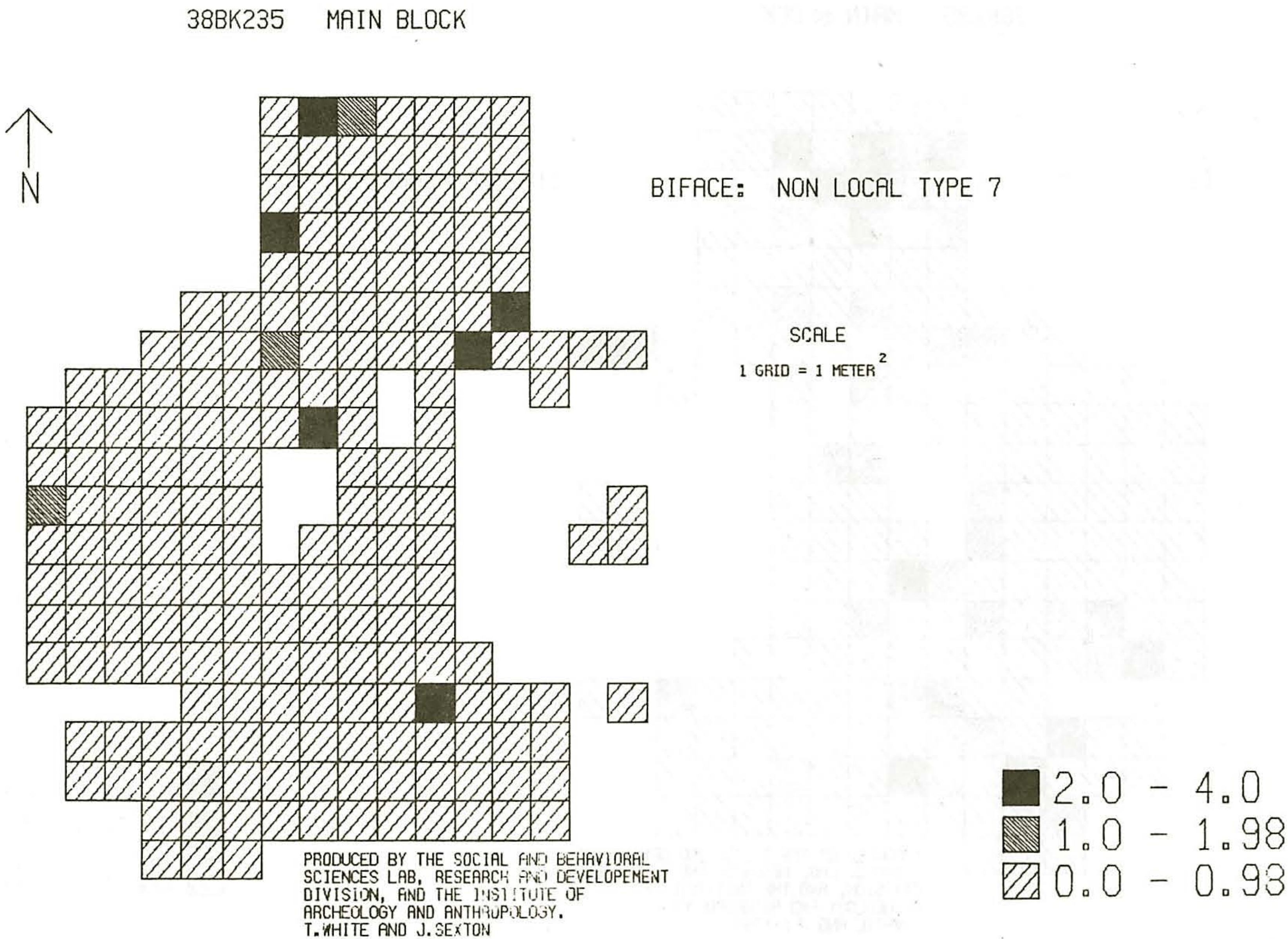


Figure 61. Spatial distribution of bifaces (Nonlocal Type 7).

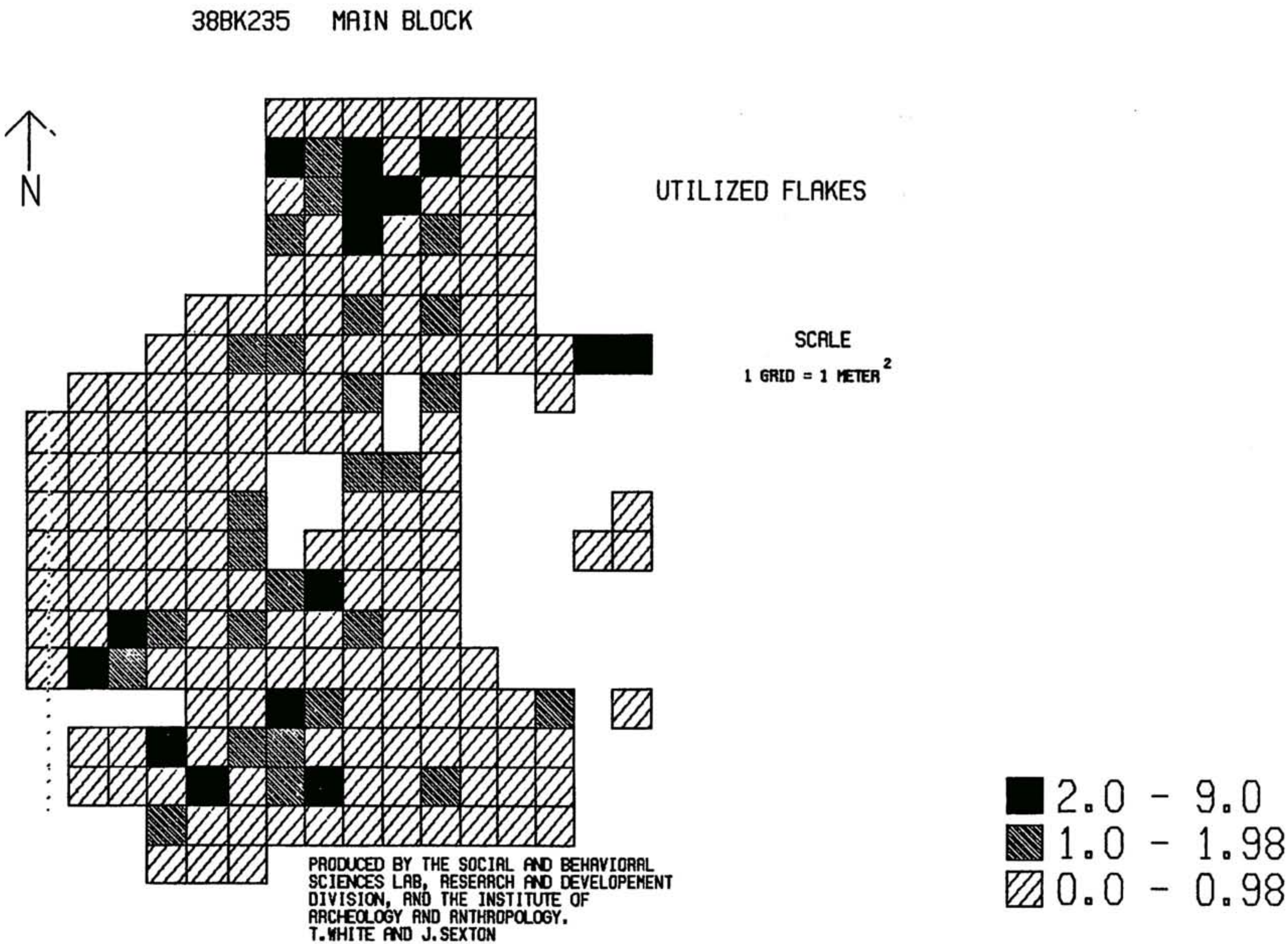


Figure 62. Spatial distribution of utilized flakes.

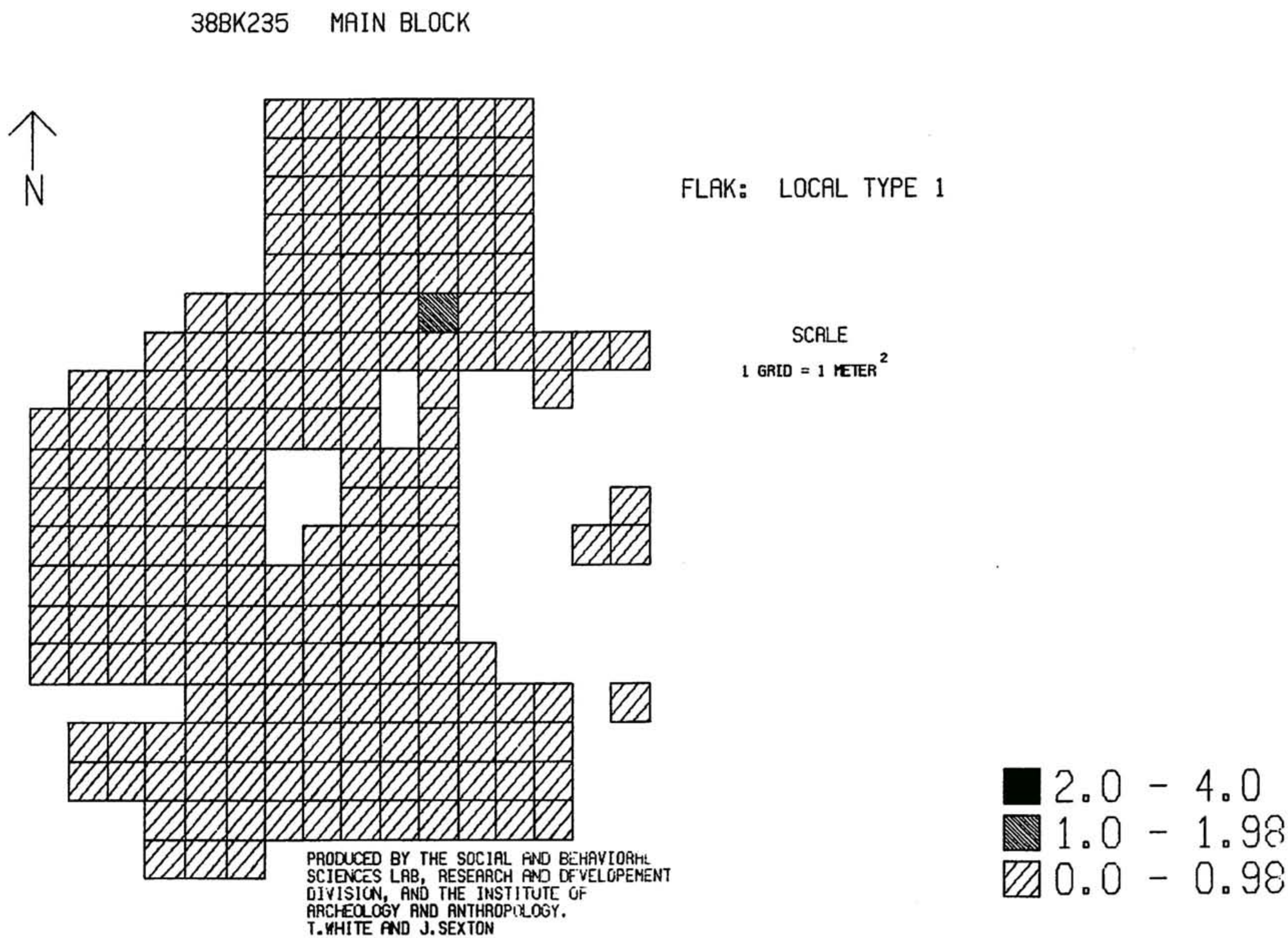


Figure 63. Spatial distribution of utilized flakes (Local Type 1).

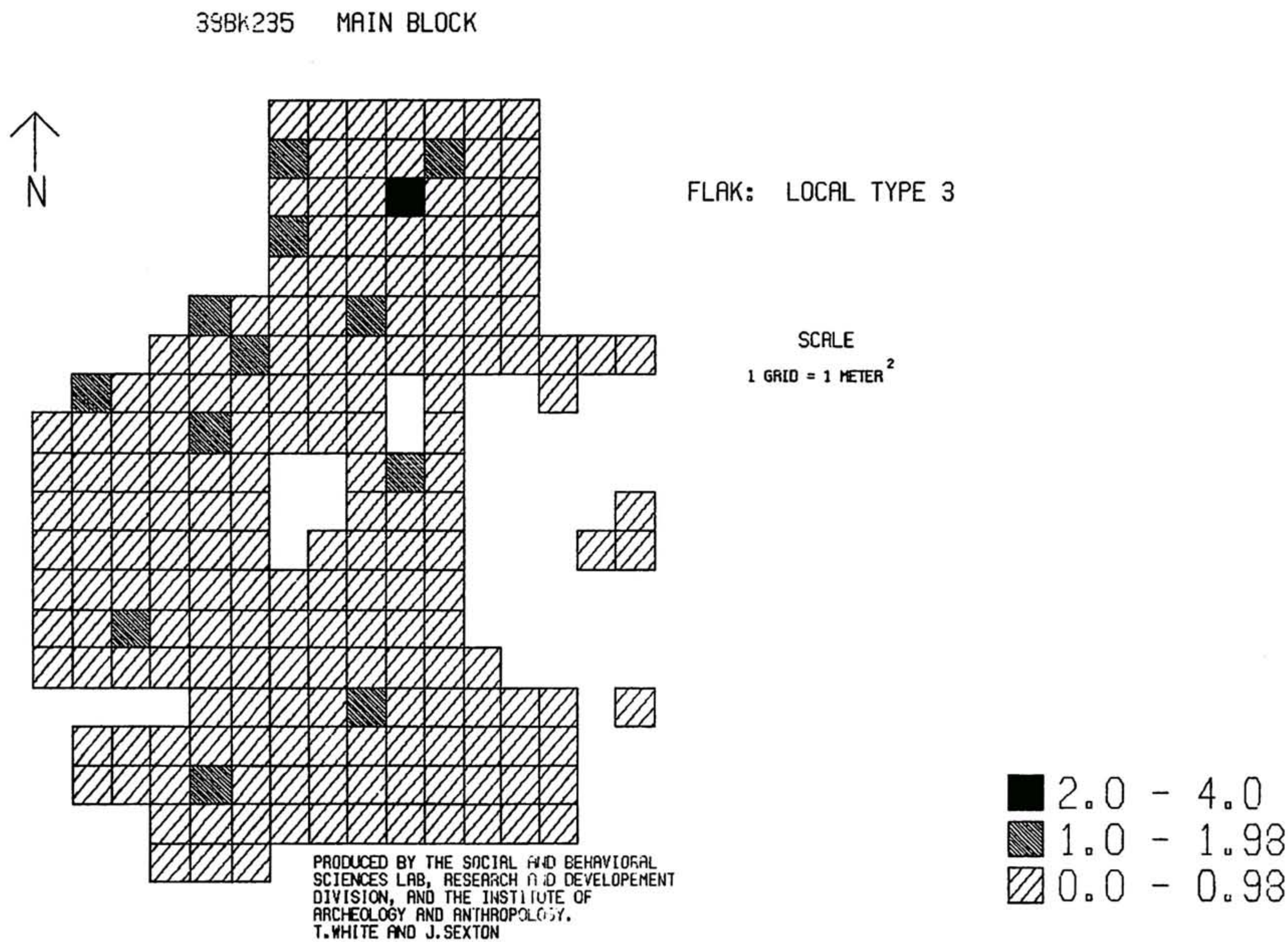


Figure 64. Spatial distribution of utilized flakes (Local Type 3).

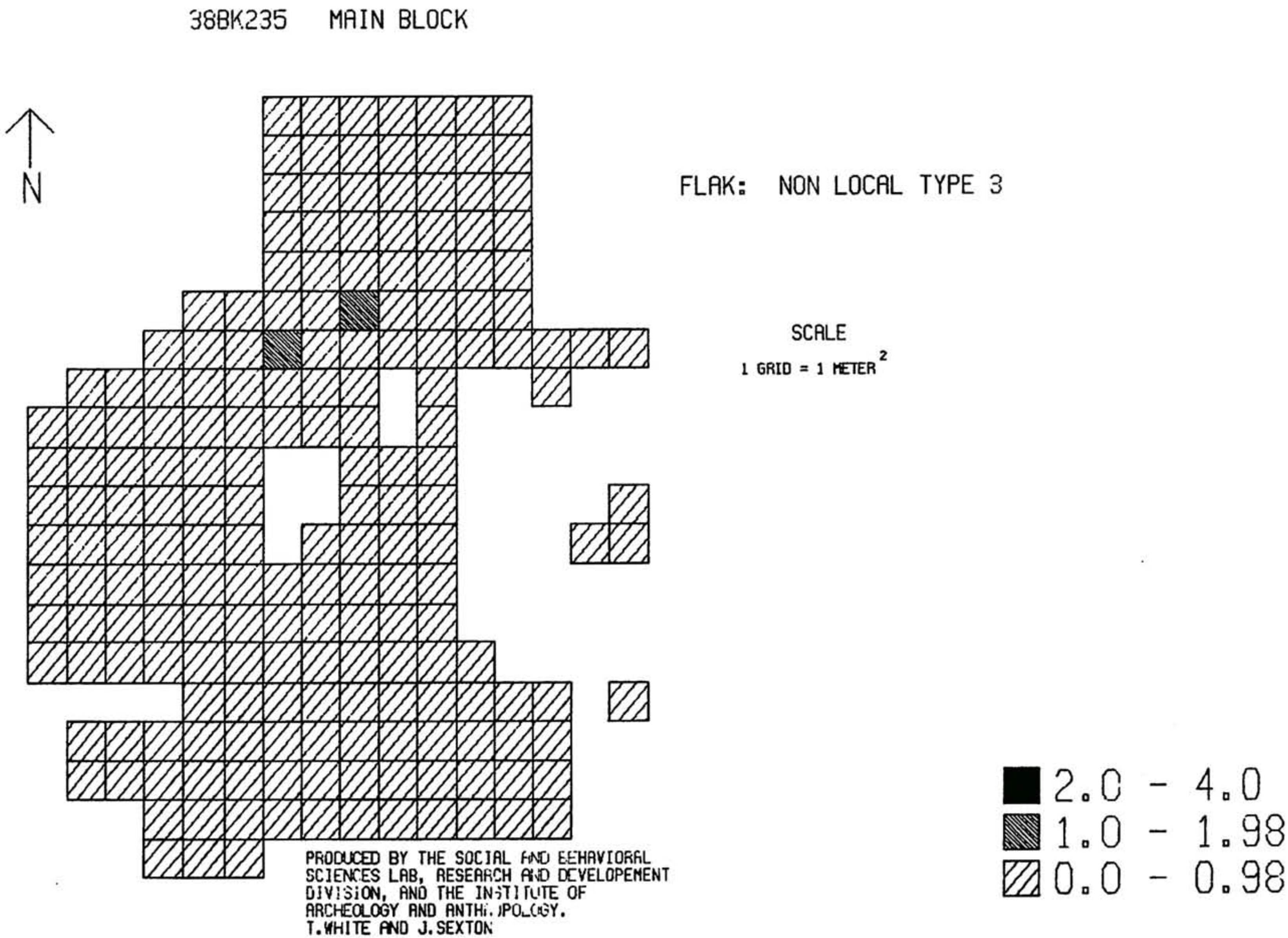


Figure 65. Spatial distribution of utilized flakes (Nonlocal Type 3).

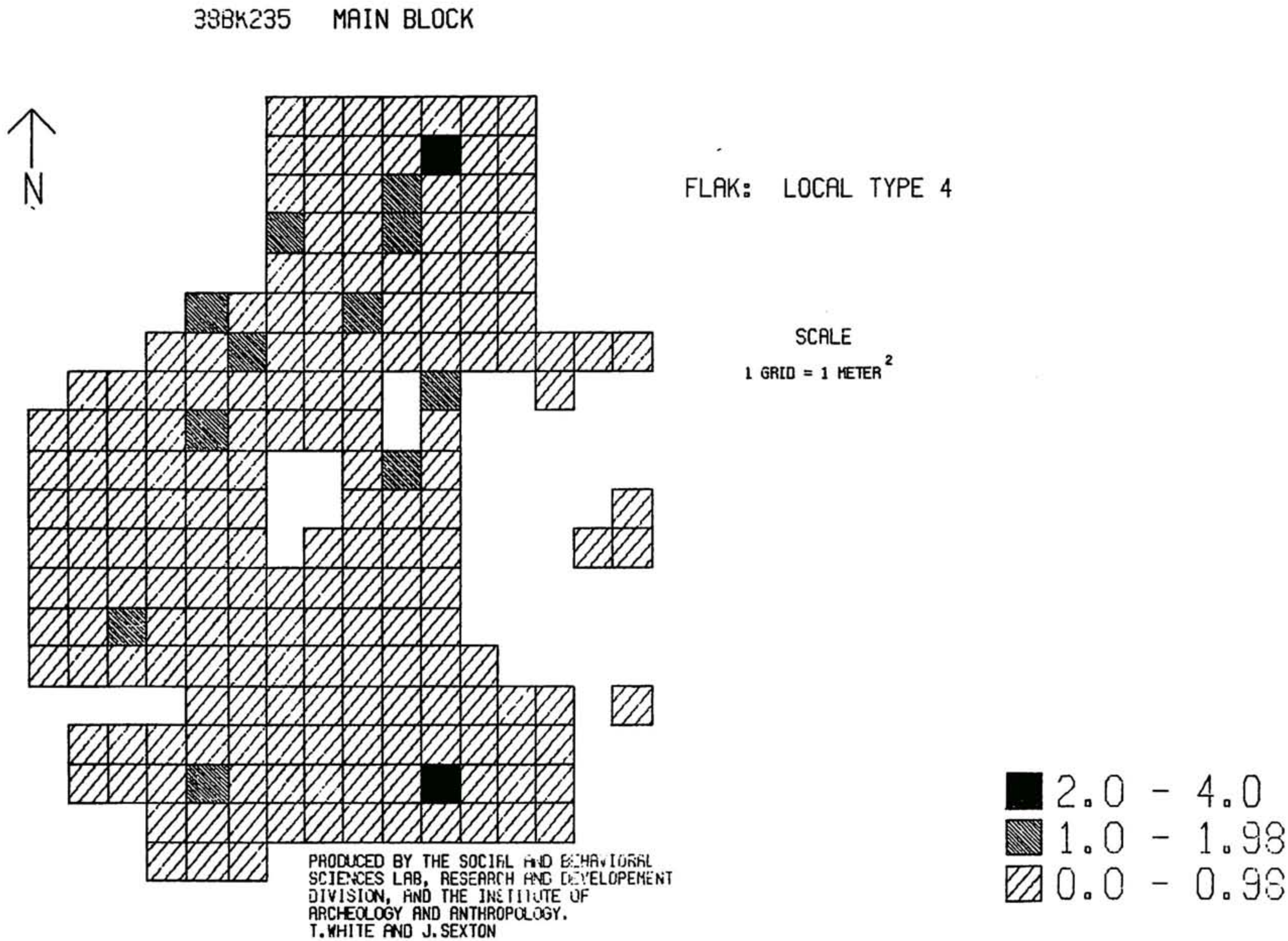


Figure 66. Spatial distribution of utilized flakes (Local Type 4).

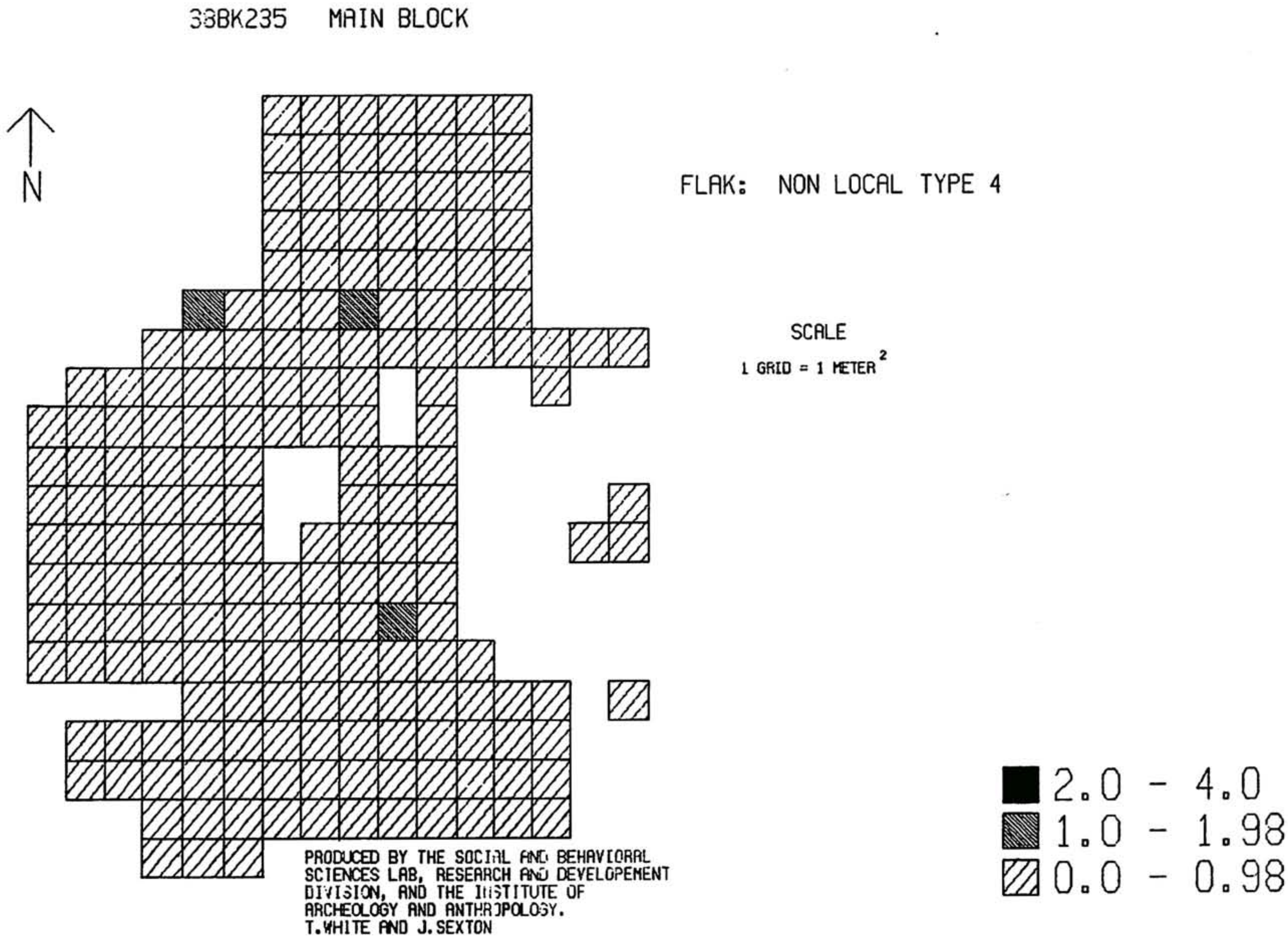


Figure 67. Spatial distribution of utilized flakes (Nonlocal Type 4).

structure. Behind the structure to the north, there is a strong tendency for bifaces and flake tools to cluster in the areas around Mississippian Features 4, 5, 6, and 10 (burial pits).

Specifically, in terms of the bifaces and flake tool functional categories (see Figs. 57-67), biface categories (L-1--local material, cutting, hard/dense; L-1--local raw material, cutting, hard/dense; L-2--local raw material, cutting, soft; N-1--nonlocal raw material, cutting, hard/dense) and flake tool categories (L-1--local raw material, cutting, hard/dense; L-3--local raw material, scraping, hard/dense; L-4--local raw material, scraping, soft; N-3--nonlocal raw material, scraping, hard/ dense; N-4--nonlocal raw material, scraping, soft) are represented in Block Excavation Area 1. Based on this inventory, it is apparent that there is a broad range of functional variability represented by the flake tool and biface assemblages. This is certainly in line with the broad range of specialized activities expected for the Mississippian habitation sites, especially in and around domestic structures.

In terms of specialized activities, the flake tool assemblage is probably most suggestive. Most of the flake tools are utilized flakes (Fig. 62) that were not identified as to specific functional category but, as indicated by the analysis, were expediently utilized for a variety of cutting and scraping functions. Nevertheless, a number of formal, specialized tools were directly associated with Feature 7 (see Table 1), including perforators, gravers, burins, and various scrapers. These artifacts suggest specialized activities (e.g., bone, wood, hide processing) in addition to those of a directly subsistence-oriented nature, as would be expected under conditions of intensive habitations.

Feature 14AA-BB

As a generalization, both bifaces and flake tools, regardless of analytical breakdown, tend to concentrate in and around the edges of Feature 14, subfeatures AA and/or BB (compare Figure 15 with the lithic artifact CALFORM maps, Figures 68-72). This spatial pattern also tends to hold for the relatively numerous utilized flakes (Fig. 69) that were not identified as to specific function, but based on the analysis, probably represent expedient use in various cutting and scraping functions.

A number of inferences may be drawn from these spatial/functional data, especially when considered in light of information presented in Chapter 3. First, the functionally identified bifaces in Feature 14BB are 11 broken and/or exhausted bifaces with extremely heavy edge damage. This, and the fact that they are of nonlocal raw material, suggest that they were specialized tools (butchering, fleshing [?]). Whether their final deposition in the bone/burial(?) pit results from unintentional discard or intentional placement is unclear (see Chapter 3).

In terms of the flake tools concentrated in and around Feature 14AA, it may be inferred, because of their considerable number and small size, that they were probably lost and/or discarded in the area of use. The functionally identified flake tools also indicate a narrow range of functions, i.e., scraping hard or soft materials (see also Table 1). Both of these wear patterns would be produced in removing flesh from bone (Neusius

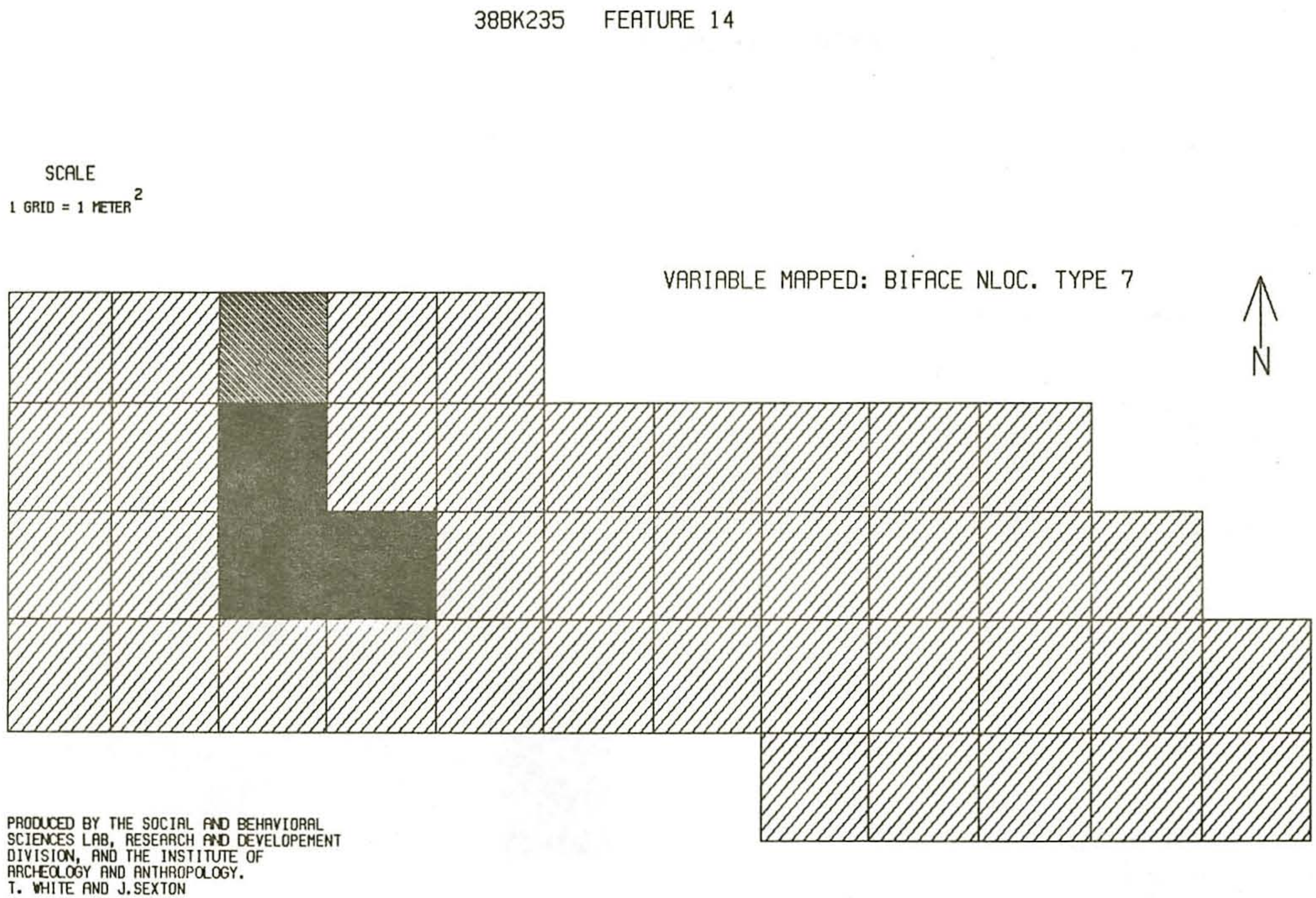


Figure 68. Spatial distribution of bifaces (Nonlocal Type 7).

2.0 - 4.0
1.0 - 1.98
0.0 - 0.98

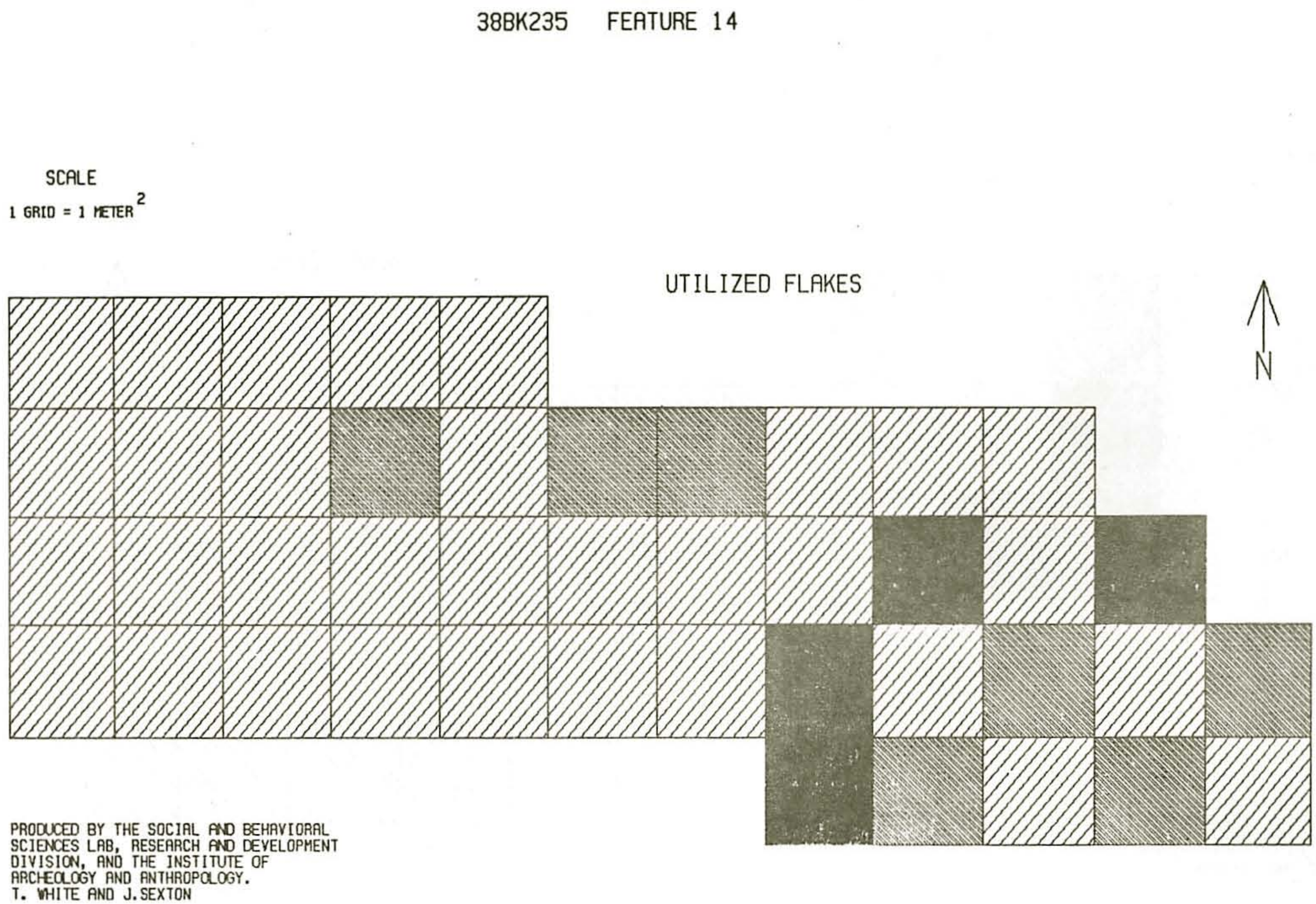


Figure 69. Spatial distribution of utilized flakes.

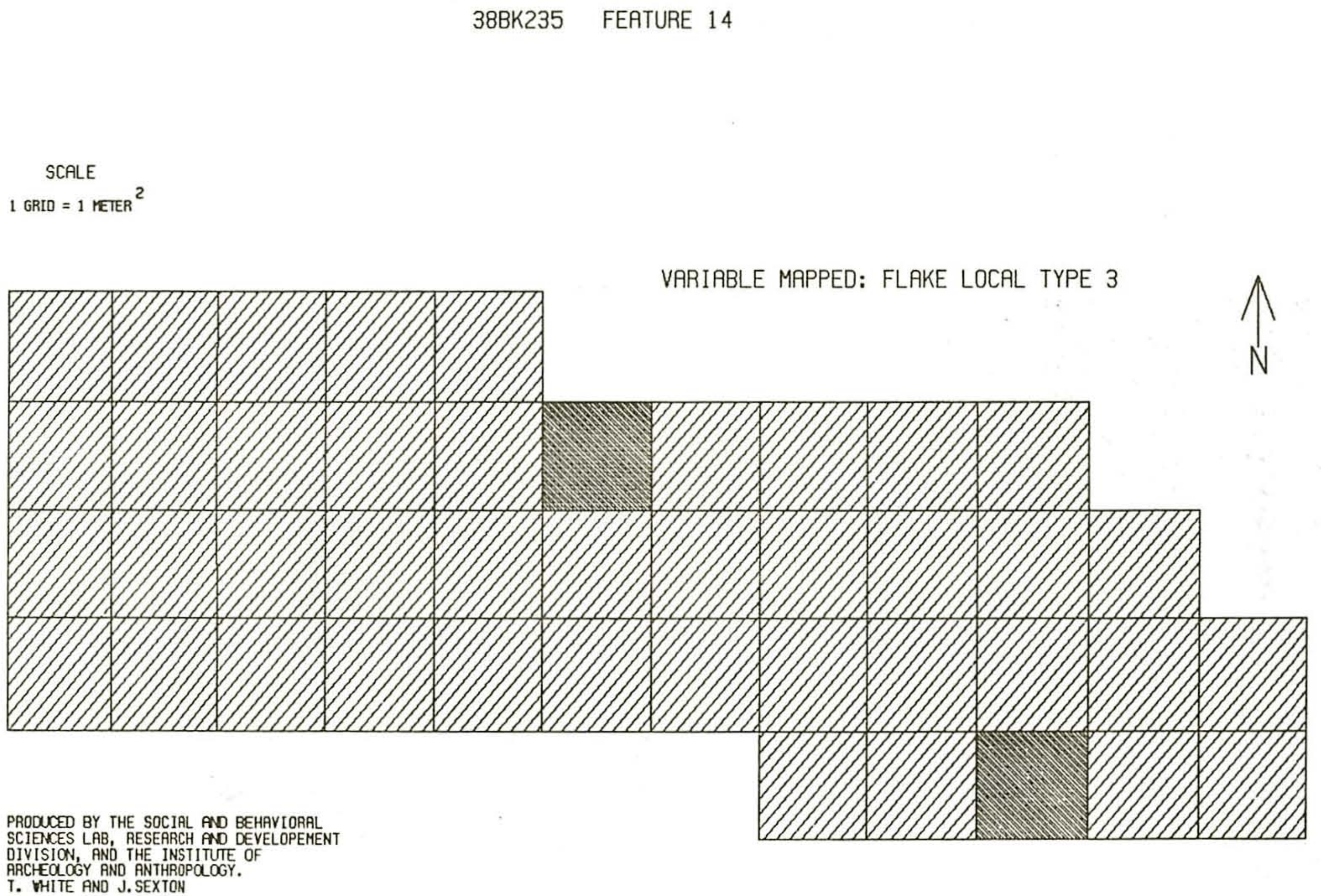


Figure 70. Spatial distribution of utilized flakes (Local Type 3).

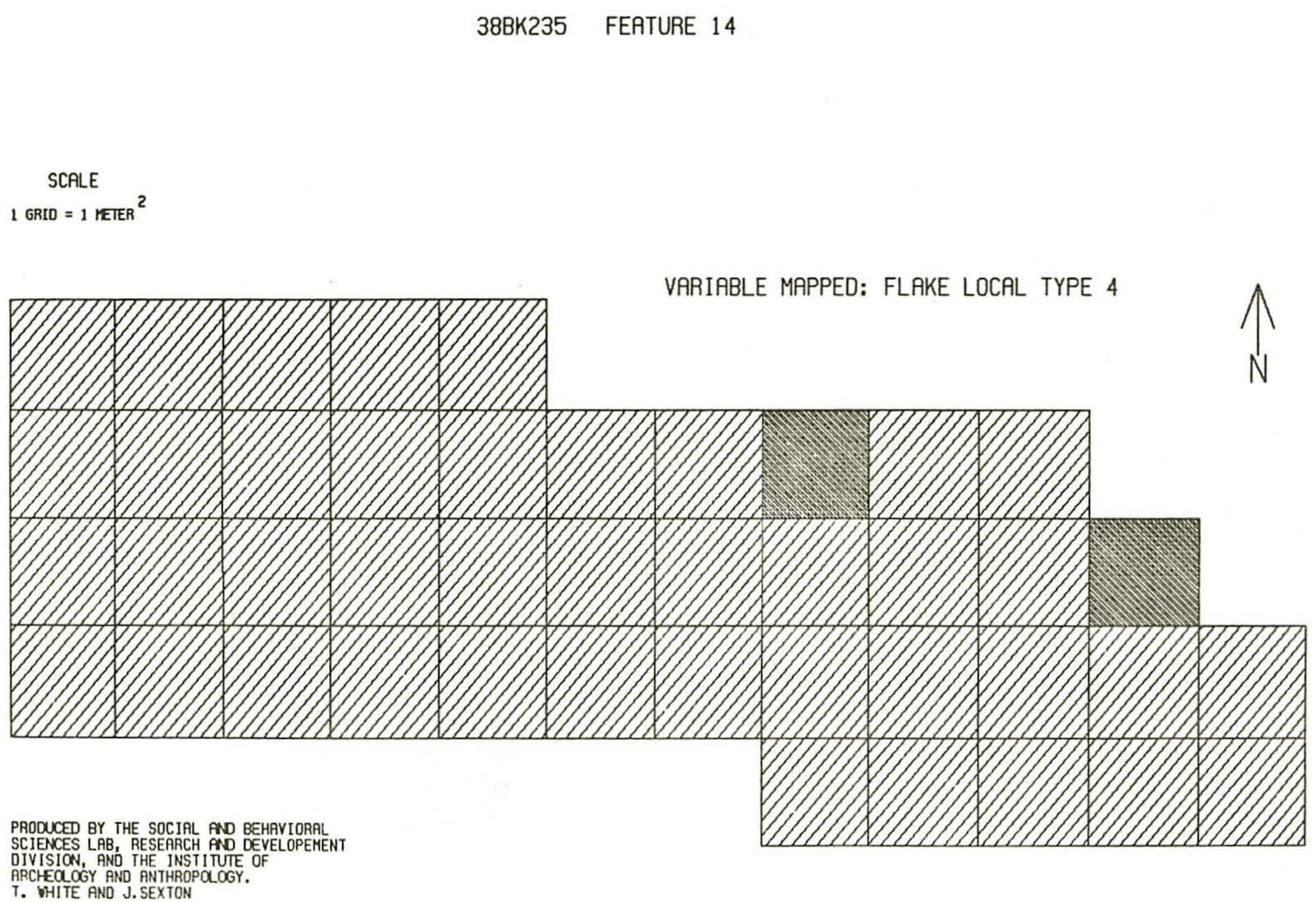


Figure 71. Spatial distribution of utilized flakes (Local Type 4).

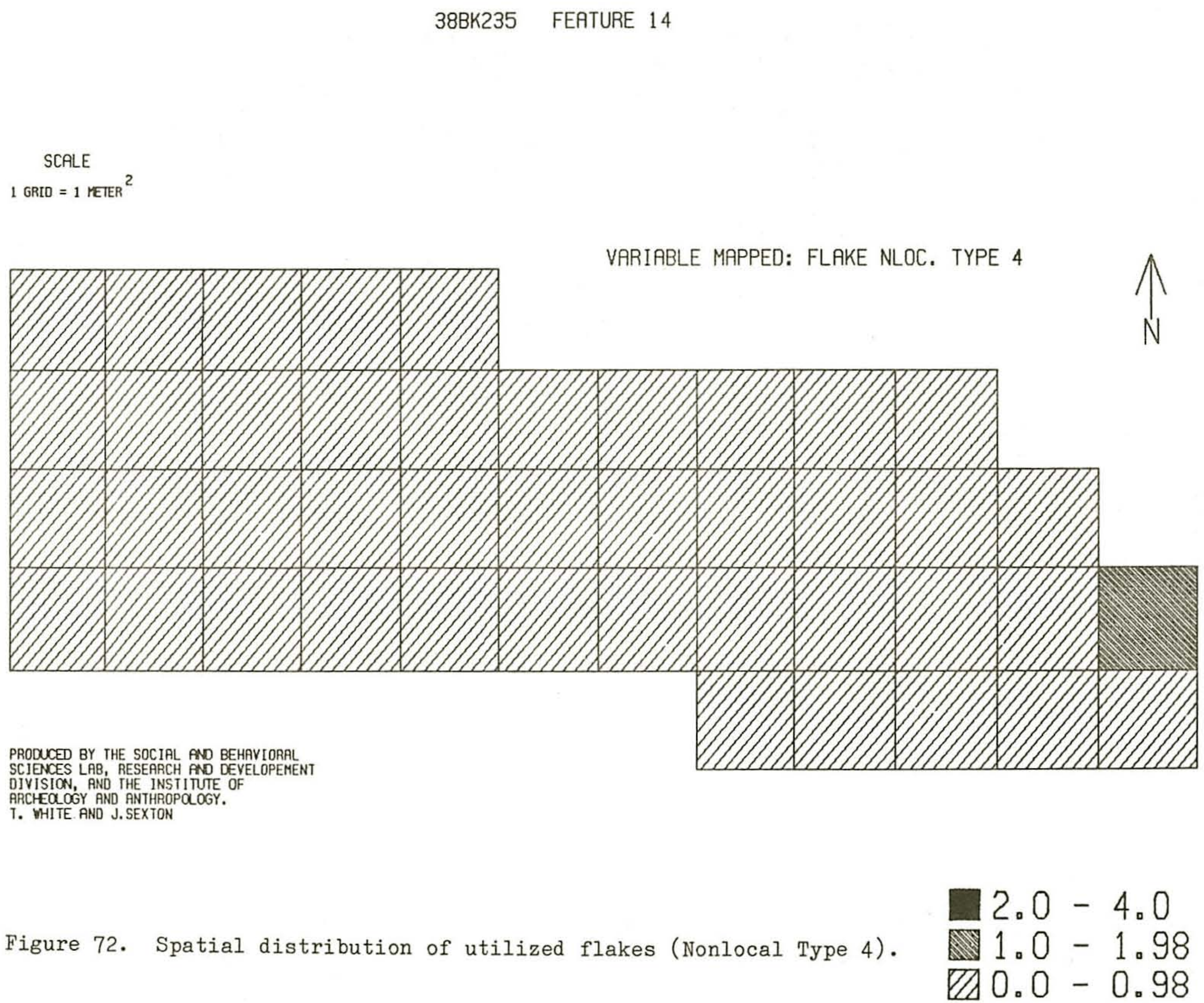


Figure 72. Spatial distribution of utilized flakes (Nonlocal Type 4).

[Data Supplement II] has determined that the bone was green prior to burning; see also Chapters 3 and 6), with the heavy edge damage incurred during contact with bone. Finally, the above biface and flake tool data indicate, in marked contrast with the biface and flake tool data from Feature 7, a relatively narrow range of specialized activities for Feature 14AA-BB.

Comparative Summary

In line with the research emphasis on Middle-Late Woodland and Mississippian subsistence-settlement change, an initial attempt has been made to examine and compare the spatial/functional variability within and between the biface and flake tool assemblages of these temporal periods. In order to accomplish this difficult task, it was first necessary to establish biface and flake tool functional categories based on the expected range of functions for each of these broad tool classes. With the functional categories established, specific use/wear edge patterns, as observed through an examination of use/wear variables found useful by other researchers (use-edge angle, use-edge morphology, type wear, location of wear) were predicted for each category. Where possible, the bifaces and flake tools were identified as to functional category. Those that were identified then were examined temporally, according to traditional types, and compared spatially.

Because of the small size of the biface and flake tool assemblage from 38BK236, which is predominantly Middle-Late Woodland, as indicated by the ceramic data, spatial comparisons of the biface and flake tool functional variability were not conducted at that site. For the same reason, temporal comparisons between 38BK235, which is predominantly Mississippian, and 38BK236 were necessarily minimal. Consequently, the emphasis was upon a consideration of Mississippian biface and flake tool spatial/functional variability at 38BK235, using data obtained from Block Excavation Areas 1 (Feature 7 and vicinity--Mississippian "domestic" or habitation structure and associated areas) and 4 (Feature 14AA-BB--a probable Mississippian structure and bone/burial[?] pit).

Little can be said about the biface and flake tool assemblages from 38BK236. All of the functionally identified biface edges (n=7) appear, with the exception of one biface, to have been made of the local orthoquartzite. The one flake tool, which was unidentified as to functional category, is a utilized flake, probably used for scraping. Thus, as expected, the Middle-Late Woodland tool assemblage is manufactured from local materials. Unexpectedly, however, all but one of the functionally identified bifaces appear to have been single-functional tools (primarily cutting) utilized for processing hard/dense materials such as wood and bone.

Even if most of the functionally identified bifaces from 38BK236 are not typologically Middle-Late Woodland, and the ceramic context indicates otherwise, these data (single-functional tools for processing hard/dense materials) do not appear to support a model that suggests a generalized subsistence strategy in which multifunctional tools were utilized for a broad range of cutting and scraping functions on hard/dense and soft materials. This apparent discrepancy may be related to duration of tool use. That is, if a tool was repeatedly utilized for a broad range of functions (multifunctional), then any distinctive wear patterns that may have existed on the tool during its use-life, or between resharpening episodes until its exhaustion, would tend to "blend" with continued use. The cumulative effect of repeated use in a wide variety of functions would be heavy edge damage on discarded/exhausted tools. Distinguishing such tools analytically from those that were truly single-functional tools used for processing only hard/dense materials would be difficult, if not impossible.

Turning to 38BK235, 132 edges were identified by functional category. As expected from the model, these bifaces were (1) mostly of local (orthoquartzite) raw material; (2) used exclusively in cutting functions; (3) largely single function; and (4) used most frequently for processing soft materials (plant and animal tissues relating directly to subsistence activities).

It was not expected, however, that the functionally identified bifaces of orthoquartzite (coarse-grained with low silicia content) would tend to have been used for processing soft materials, or, conversely, that bifaces of nonlocal, highly siliceous raw materials would be used almost exclusively for cutting hard/dense materials. The reverse was expected.

As already suggested, this apparent discrepancy may be due to differences in raw material properties. Because highly siliceous raw materials tend to have fragile edges, the use-edges are more susceptible to heavy damage, even when processing soft materials. Heavy damage (i.e., heavy nibbling), generally considered indicative of wear resulting from processing hard/dense materials, would be even greater if, as expected, bifaces of nonlocal, highly siliceous materials tended to be curated and more intensively utilized. The local orthoquartzite might be utilized more expediently and, due to its coarse-grained nature might be less susceptible to edge damage, even if used for processing hard/dense materials.

An examination of the functionally identified bifaces from 38BK235 that are considered "temporally diagnostic" indicates that both Middle-Late Woodland and Mississippian bifaces were made exclusively of orthoquartzite. This pattern was not expected and may result from any one of several possibilities: (1) sampling bias; (2) an inability adequately to distinguish temporally diagnostic bifaces, and (3) the possibility that Middle-Late Woodland and Mississippian populations were even more locally self-sufficient than assumed.

A fourth alternative explanation for the apparent Mississippian emphasis on local raw material for bifaces is more likely related to tool function and the material being processed. Nearly all of the functionally identified Mississippian bifaces from 38BK235 exhibit very light edge damage, usually interpreted as resulting from cutting soft materials. On the other hand, the light edge damage indicates expedient use as generalized cutting/piercing tools and/or certain specialized cutting/piercing functions not requiring highly siliceous materials. In this respect, if the bifaces, all of which are identified as Mississippian small triangular stemmed and unstemmed forms, were used as projectile arrow points (as is often suggested), there would be little edge damage. Similarly, there would be little need for highly siliceous raw materials for piercing functions.

Both the Middle-Late Woodland bifaces and the Mississippian bifaces from 38BK235 appear to have been used primarily for cutting soft materials. But, like those observed at 38BK236, the Middle-Late Woodland bifaces have a greater tendency than the Mississippian bifaces to have been used for cutting hard/dense materials. As suggested earlier, there may have been a tendency for Middle-Late Woodland bifaces to be utilized intensively for a broad range of functions (in line with the generalized subsistence strategy hypothesized), causing heavy edge damage that may or may not have resulted from exclusive use on hard/dense materials.

The flake tool assemblage from 38BK235 consisted of 43 tool and utilized flake edges that were identified as to functional category, with single-functional (dominant) and multifunctional tools represented. Both local (dominant) and nonlocal raw materials were used for a wide variety of cutting and scraping functions, with a strong emphasis on scraping functions oriented slightly toward soft materials.

It may be significant that 8 (18.6%) of the flake tools (formal and utilized flakes) identified as to function are of nonlocal material. All of these were used in scraping functions on either hard/dense or soft materials. If these are Mississippian (most are associated with Feature 7), than an effort was made by the Mississippian inhabitants of 38BK235 to obtain highly siliceous, nonlocal raw materials for certain flake tools, presumably for specialized functions.

Based on the above comparison of Middle-Late Woodland and Mississippian biface and flake tool assemblages, both populations used predominantly local raw materials, though in different ways and with different emphasis, and were therefore, relatively self-sufficient. Nevertheless, the Mississippian inhabitants of 38BK235 apparently made an effort to obtain highly siliceous, nonlocal raw materials for at least some specialized functions.

Broadly speaking, an examination of Mississippian intrasite spatial/functional variability, via the biface and flake tool assemblages at 38BK235, suggests that a broad range of specialized activities occurred in spatially discrete areas of the site. This general pattern was predicted by the subsistence-settlement model for Mississippian habitation sites in riverine areas.

Specifically, an examination of biface and flake tool spatial/functional variability in Block Excavation Area 1 indicates a strong spatial association between various functionally defined bifaces and flake tools and the Mississippian features, specifically in and around Feature 7 ("domestic" or habitation structure). The biface and flake tool assemblages indicate a tremendous range of functional variability in the Feature 7 area, indicative of the wide variety of specialized activities expected under conditions of intensive habitation. In this respect, the flake tool assemblage is especially suggestive. A wide variety and number of utilized flakes and formal flake tools, including spokeshaves, gravers, perforators, burins, and various scrapers (mostly of nonlocal raw material) are present.

Specialized activities (e.g., bone, wood, hide processing, etc.), in addition to those directly related to subsistence, are indicated.

By contrast, the biface and flake tool assemblages from the Feature 14AA-BB area (Block Excavation Area 4) indicate a spatially discrete, highly specialized activity area for the processing and disposal of human and animal remains. This pattern is suggested by the spatial associations of specific, functionally defined bifaces and flake tools with the osteological remains.

The biface and flake tool assemblages are characterized by low functional diversity, indicating a narrow range of specialized activities involving butchering and/or fleshing. The functionally identified bifaces (large stemmed and notched "Archaic" forms occurring in a Mississippian context) are all of nonlocal raw material, exhibit heavy edge damage indicative of butchering, are broken and/or exhausted, and were discarded along with osteological remains in Feature 14BB.

The functionally identified flake tools are of both local and nonlocal raw materials; but in contrast with those from the Feature 7 area, they indicate only a narrow range of scraping functions, probably related to butchering and/or fleshing. Most of these tools, including the numerous utilized flakes that were not identified as to function, occur in and around Feature 14AA and were, presumably, discarded in the area of use.

CHAPTER 6

PALEOECOLOGICAL AND HUMAN OSTEOLOGICAL RESEARCH

Introduction

This chapter serves two functions: (1) to summarize the results of the paleoethnobotanical, osteological, palynological, and soil chemical analyses; and (2) to relate these substantive findings to interpretations of the resource variability and functional variability of activity areas within and between sites 38BK235 and 38BK236. The first part presents the paleoecological results simply and briefly for the benefit of the reader who wishes to absorb the principal findings within a few pages. This summary is not to be considered a substitute for the detailed reports prepared by Deborah M. Pearsall and Eric E. Voigt (Data Supplement I--ethnobotany), Sarah W. Neusius (Data Supplement II--osteology), Michael J. Andrejko (Data Supplement IV--palynology), and Alf Sjoberg (Data Supplement V--soil chemistry), to which the reader is referred for more detailed discussions. The second part relates these data to the implications of the corollary hypotheses concerning subsistence and exploitative strategies (CH_1) and the further definition of activity areas (CH_5), first presented in Chapter 3.

Part I. Paleoecological Data

Paleoethnobotanical Analysis

Paleoethnobotanical analysis was undertaken in the Cooper River project in order to discover the kind of environment that characterized the area of sites 38BK235 and 38BK236 during the Middle Late Woodland and Mississippian periods and to produce information relating directly to hypotheses concerning subsistence strategies. In Chapter 3 the process of field data recovery, which included the systematic recovery of soil samples for flotation, phytolith analysis, pollen analysis, and soil chemical analysis, was outlined. In this section results of the analysis of plant remains reclaimed by flotation and phytolith processing are summarized.

The construction of a plausible model of the environment from ca. 3,000 to 1,000 years ago is essential to the testing of the model outlined in Chapter 2. More specifically, distinguishing between the subsistence strategies employed by the inhabitants of sites 38BK235 and 38BK236 is requisite to testing the hypothesis that resource variability (in terms of species diversity and/or species frequency) increased from Middle-Late Woodland to Mississippian times.

Methods

Information on local vegetation and its exploitation by humans was derived for sites 38BK235 and 38BK236 by the identification of wood charcoal, nuts, seeds, fruit fragments, and opal phytoliths. The first four of these were identified at magnifications ranging from 7X to 45X, while the phytoliths were observed and counted at 250X magnification.

Flotation of soil samples was completed at the end of the fieldwork phase using a closed tank system. Briefly described, a large basin was filled with water and two sets of screens (1/4 inch and 1 inch) were placed atop the basin. The flotation sample was then introduced into the basin (through the screens) and water-screened gently using an adjustable nozzle on a common garden hose. Any materials (artifacts, organic materials, etc.) that did not wash through the screen were retained and set aside on a tray. The screens were then removed and the water containing the remainder of the sample was stirred to raise the light fraction. The light fraction was then scooped out of the basin using a kitchen strainer. The material was tamped out onto multiple (8-10) layers of cheesecloth. This process was repeated minimally five times before the basin was drained. A small mesh (window) screen was placed under the drainage spout of the basin. The water, soil, and any remaining organic materials were washed into this screen. When the basin was emptied, the sand in the screen was examined for any artifacts, seeds, bones, etc. that could be retrieved. These materials were added to the light fraction and tied into a small sack of cheesecloth to be allowed to dry. This procedure was performed for all samples.

When dry, all charcoal was removed from the heavy fraction and added to the light fraction for each sample, and the samples were sent to Deborah Pearsall at the American Archaeology Division, University of Missouri, Columbia, for identification. There the samples were weighed, sifted, sorted, and then identified, referring to published information and comparative collections.

Soil samples for phytolith analysis were sent directly to Pearsall at the University of Missouri, where they were processed with a chemical flotation procedure in order to extract the phytoliths. After mounting the phytoliths on slides, identification and measurement of the phytoliths enabled their grouping into the subgroups festucoid, chloridoid, and panicoid, and the calculation for each sample of a ratio of nongrass to grass phytoliths. Festucoid phytoliths occur in grasses adapted to locally moist conditions, while chloridoid and panicoid types occur in grasses growing in more prairie-like conditions--short-grass prairie and tall-grass prairie, respectively. As might be expected, chloridoid phytoliths were identified least frequently, accounting for less than 5% in any sample. Pearsall (1978) has demonstrated that maize produces panicoid phytoliths distinguishable from those of wild panicoid grasses. Few plants outside of the grass family produce distinctive silica bodies, but a few of the Cooper River samples did include some identifiable herbaceous and woody types.

Phytolith analysis was undertaken only for site 38BK235 because the deposits at site 38BK236 were thought to be too close to the surface to be reliable.

Results

At site 38BK236 (Tables 30 and 31), believed to be Middle-Late Woodland, the macrobotanical analysis yielded 1,216 fragments of identifiable wood, 80% of which is softwood (Pinus sp.). By contrast, only 67% of the wood identified at 38BK235 is softwood. Hardwoods identified at 38BK236 include oak, hickory, magnolia, sycamore, walnut, elm, soft maple, ash, willow/cottonwood, and persimmon. Grape vine and magnolia were identified at 38BK236 but not at 38BK235. The presence of magnolia may suggest a nearby succession toward a mature forest.

Nuts and fruits identified at 38BK236 include walnut, hickory, persimmon, dogwood, and pine, while the seeds of a number of weedy herbaceous plants were found (e.g., chenopod, blackberry, bedstraw) as well. No indication of maize was present, nor were there remains of those plants favoring open-water or swamp-edge habitats. One must bear in mind, of course, that relatively low representation, or even absence of certain taxa in the paleoethnobotanical record does not indicate that the plants were absent or unexploited by the inhabitants of the site (Ford 1979).

The identified remains from 38BK235 (Tables 32 and 33), the Mississippian period site, included 1,625 pieces of wood. Softwood taxa account for two-thirds of this total, and include Juniperus as well as Pinus. Hardwoods identified include oak, hickory, sycamore, walnut, elm, willow/cottonwood, soft maple, white ash, and persimmon. Neither magnolia (Magnolia sp.) nor tulip (Liriodendron), genera expected in a developed coastal climax forest, are present.

Seed, nut, and fruit remains at 38BK235 include walnut and grape, as well as chenopod, bedstraw, and other herbaceous annuals. Remains of a small, nondent type maize were found. Taxa common to water-edge or open-water habitats are absent. Preservation of botanical remains at 38BK235 was best in Feature 7 and in the area immediately around it (see Chapter 3). Hardwood predominates over softwood only in two places at 38BK235: Feature 11/12 and Feature 14AA. Subfeature U of Feature 14AA contains a relative abundance of red oak. The area of Feature 14AA also yielded three maize cupules in close association with a probable storage pit (subfeature D'). Feature 14BB, which contained remarkably high quantities of burned human and other animal bones, yielded only 89 pieces of wood charcoal, 62% of which is softwood. This pattern is typical of Feature 7, but quite unlike nearby Feature 14AA, with its predominance of hardwoods.

Phytoliths were identified in all soil samples processed from site 38BK235 (Tables 34 and 35). Although the phytolith assemblage must be interpreted with caution, due to the shallowness of the deposit, some interesting patterns may be observed. First, grass types dominate, with very few phytoliths of herbaceous or woody plants appearing. A few sedge (Cyperacea) types do occur. The vast majority of the phytoliths are festucoid, suggesting the in situ decay/burning of grasses living near standing water or areas that were periodically inundated. Festucoid types average 91% in Feature 7 samples, while nongrass phytoliths are virtually nonexistent. In Feature 1, thought to be a hearth, festucoid types average 88%, but nongrass phytoliths are relatively high (20% nongrass phytoliths, compared to less than 5% for Feature 7). In situ burning of wood would

TABLE 30

PERCENTAGE DISTRIBUTION OF WOOD TAXA FOR SITE 38BK236

Site 38BK236 * <1%

Fl	Provenience	Level	Additional Information	TOTAL WOOD	Pinus spp.	Pinus spp., southern	Pinus strobus	Juniperus	Unidentifiable Softwood	TOTAL SOFTWOOD	Quercus spp., white	Quercus spp., red	Quercus spp.	Quercus virginiana	Carya spp.	Juglans spp.	Ulmus spp.	Magnoliaceae	Salicaceae	Platanus occidentalis	Acer spp., soft	Fraxinus spp., white	Diospyros virginiana	Vitis spp.	Ring porous	Diffuse porous	Unidentifiable hardwood	TOTAL HARDWOOD
	Feature 1			346	47	21				68	*		1		3			1	1	*				*	10	1	13	32
	Grid Samples			870	62	21	1		*	84	*	*	1	*	1			1	1	*				*	3	3	6	16
	TOTAL			1216	58	21	1		*	80	*	*	1	*	1			1	1	*				*	5	2	8	20

TABLE 31

SEED, NUT, AND OTHER REMAIN TOTALS FOR SITE 38BK236

Site 38BK236

Fl	Provenience	Level	Additional Information	Juglandaceae	Juglans nigra	Carya spp.	Quercus spp.	Diospyros virginiana	Cornus spp.	Pinus spp.	Vitis spp.	Rhus spp.	Chenopodium spp.	Rubus spp.	Galium spp.	Gramineae	Leguminosae	Polygonaceae	Liliaceae	Zea mays, kernel	Z. mays, cupule	Unknown	Unidentifiable	TOTAL
	Feature 1								1	2					3				1			1	19	27
	Grid Samples			1		2		1	48	10	3		1	1		1	1	2				3	63	137
	TOTAL			1		2		1	49	12	3		1	1	3	1	1	2	1			4	82	164

TABLE 32

PERCENTAGE DISTRIBUTION OF WOOD TAXA
BY FEATURE AND GRID AREAS IN SITE 38BK235

Site 38BK235 * <1%

Pl	Provenience	Level	Additional Information	TOTAL WOOD (COUNT)	Pinus spp.	Pinus spp., southern	Pinus strobus	Juniperus	Unidentifiable Softwood	TOTAL SOFTWOOD	Quercus spp., white	Quercus spp., red	Quercus spp.	Quercus virginiana	Carya spp.	Juglans spp.	Ulmus spp.	Magnoliaceae	Salicaceae	Platanus occidentalis	Acer spp., soft	Fraxinus spp., white	Diospyros virginiana	Vitis spp.	Ring porous	Diffuse porous	Unidentifiable hardwood	TOTAL HARDWOOD
	Feature 7		Subfeatures	308	50	14	1			65		7	1		*				1	1	*	*			8	3	13	35
			Grid Samples	283	63	14				77			1		*						*		*		3	2	16	23
			TOTAL	591	56	14	1			71		4	1		*				*	*	*	*	*		6	2	15	29
	Feature 1		TOTAL	151	59	14				73	1	2	1	1	2					5					8	2	5	27
	Feature 9		TOTAL	6	33	17				50															17	-	33	50
	Grid Outside Feature 7		TOTAL	302	51	13		*		64		*	*		1		*		*	*					6	2	25	36
	Assoc. with Feature 7 unclear		TOTAL	103	52	16			4	72		1	2												7	5	14	28
	Feature 14 AA		Subfeatures	55	24					24		11													4	2	60	76
			Grid Samples	19	58					58															11	11	21	42
			TOTAL	74	32					32		4													5	4	50	68
	Feature 14 BB		Subfeatures	36	67					67					6										11	6	11	33
			Grid Samples	53	57	2				59										2					6	2	32	42
			TOTAL	89	61	1				62					2					1					8	3	24	38
	Grid Outside Feature 14		TOTAL	76	53	4				57		4			1				1						14	4	18	43
	Feature 2		TOTAL	51	53	33				86					2					2					8		2	14
	Feature 3		TOTAL	10	60	40				100																		0
	Feature 5		TOTAL	73	56	15			1	72		1	3												7		16	27
	Feature 6		TOTAL	2						0																	100	100
	Feature 10		TOTAL	3	67					67																	33	33
	Feature 11			4	75					75																	25	25
	Feature 11-12			30	60					60					13										10	3	13	40
	Feature 12			20						0					100													100
			TOTAL	54	39					39					44										6	2	9	61
	Grid Outside Features 2-6, 10-12		TOTAL	66	61	6				67	2	2	2			2				2					5		21	32
	Feature 13		TOTAL	2	100					100																		0
	Feature 15		TOTAL	1	100					100																		0
	Feature 16		TOTAL	27	70					70															4	4	22	30
	Feature 17		TOTAL	2	50					50																	50	50
	Excavation Area 2		TOTAL	45	44	13	-	-		57				-	7										7	2	27	42
	TOTAL SITE			1625	54	12	*	*	*	66	*	2	1	*	2	*	*		*	1	*	*	*		7	2	18	34

TABLE 33

SEED, NUT, AND OTHER REMAIN TOTALS
FOR FEATURES AND GRID AREAS IN SITE 38BK235

Site 38BK235

Fl	Provenience	Level	Additional Information	Juglandaceae	Juglans nigra	Carya spp.	Quercus spp.	Diospyros virginiana	Cornus spp.	Pinus spp.	Vitis spp.	Rhus spp.	Chenopodium spp.	Rubus spp.	Galium spp.	Gramineae	Leguminosae	Polygonaceae	Liliaceae	Zea mays, kernel	Z. mays, cupule	Unknown	Unidentifiable	TOTAL
	Feature 7		Subfeatures	10		2							1							1		1	5	20
			Grid Samples	4			1	1															5	11
			TOTAL	14		2	1	1					1							1		1	10	31
	Feature 1		TOTAL	2	3	6	1		1														1	14
	Feature 9		TOTAL			1																		1
	Grid Outside Feature 7		TOTAL		1	5			2			1			1								16	26
	Assoc. with Feature 7 unclear		TOTAL	2	3						1												3	9
	Feature 14 AA		Subfeatures	1		1																	1	3
			Grid Samples																		3		4	7
			TOTAL	1		1															3		5	10
	Feature 14 BB		Subfeatures	1					1		1												4	7
			Grid Samples	4					1		1					2								8
			TOTAL	5					2		2					2							4	15
	Grid Outside Feature 14		TOTAL																					0
	Feature 2		TOTAL				1										1						3	5
	Feature 3		TOTAL																					0
	Feature 5		TOTAL		2	2	2	1															1	8
	Feature 6		TOTAL																					0
	Feature 10		TOTAL																					0
	Feature 11																							0
	Feature 11-12			1																			1	2
	Feature 12			1																				1
			TOTAL	2																			1	3
	Grid Outside F. 2-6, 10-11		TOTAL	3													1							4
	Feature 13		TOTAL																					0
	Feature 15		TOTAL																					0
	Feature 16		TOTAL																				1	1
	Feature 17		TOTAL																					0
	Excavation Area 2		TOTAL	1																			2	3
	TOTAL SITE			30	9	17	5	2	5		3	1	1		1	2	2			1	3	1	47	130

TABLE 34

PHYTOLITHS FROM FEATURES 7, 1, AND 9, AND THE GRID AREAS OUTSIDE FEATURE 7

	Grass Short Cells							Non-Grass					NG/G	Cross Shaped							Cyperaceae	Diatom
	Festucoid No.	Festucoid %	Chloridoid No.	Chloridoid %	Panicoid No.	Panicoid %	Total Grass	Dense No.	Dense %	Plate-like No.	Plate-like %	Total Non-G		Small No.	Small %	Medium No.	Medium %	Large No.	Large %	Total		
Feature 7																						
203 7 G	174	87	4	2	22	11	200	1	8	11	92	12	0.06	1	100	0	0	0	0	1	2	0
210 7 R	185	93	2	1	13	7	200	0	0	3	100	3	0.02	2	100	0	0	0	0	2	1	0
212 7 P	178	89	3	2	19	10	200	0	0	7	100	7	0.04	1	50	1	50	0	0	2	0	0
219 7 Y	181	91	2	1	17	9	200	7	64	4	36	11	0.06	4	100	0	0	0	0	4	2	0
206 158-159S/298-299E	179	90	2	1	19	10	200	2	8	24	92	26	0.13	0	0	0	0	0	0	0	3	0
208 161-162S/299-300E	192	96	2	1	6	3	200	0	0	1	100	1	0.01	1	100	0	0	0	0	1	2	0
TOTAL	1089	91	15	1	96	8	1200	10	17	50	83	60	0.05	9	90	1	10	0	0	10	10	0
Feature 1																						
213 158-159S/298-299E	180	90	7	4	13	7	200	34	30	79	70	113	0.57	2	100	0	0	0	0	2	0	0
216 C, 25-30 cm	180	90	5	3	15	8	200	4	33	8	67	12	0.06	0	0	1	100	0	0	1	0	1
217 C, 27-29 cm	167	84	5	3	28	14	200	15	52	14	48	29	0.15	2	50	1	25	1	25	4	3	0
TOTAL	527	88	17	3	56	9	600	53	34	101	66	154	0.26	4	57	2	29	1	14	7	3	1
Feature 9																						
209 Posthole	178	89	7	4	15	8	200	2	33	4	67	6	0.03	5	71	2	29	0	0	7	0	0
Outside Feature 7																						
207 162-163S/297-298E	189	95	1	1	10	5	200	0	0	8	100	8	0.04	1	100	0	0	0	0	1	3	0
220 158-159S/290-291E	168	84	4	2	28	14	200	4	50	4	50	8	0.04	4	67	2	33	0	0	6	0	0
TOTAL	357	89	5	1	38	10	400	4	25	12	75	16	0.04	5	71	2	29	0	0	7	3	0

TABLE 35

PHYTOLITHS FROM FEATURES 5, 13, 14, AND 15; AND EXCAVATION AREA 2

	Grass Short Cells							Non-Grass						Cross Shaped								
	Festucoid No.	%	Chloridoid No.	%	Panicoid No.	%	Total Grass	Dense No.	%	Plate-like No.	%	Total Non-G	NG/G	Small No.	%	Medium No.	%	Large No.	%	Total	Cyperaceae	Diatom
Feature 5																						
202 20-30 cm	185	93	0	0	15	8	200	4	20	16	80	20	0.10	2	67	1	33	0	0	3	0	0
Feature 13																						
204 Interior	183	92	1	1	16	8	200	0	0	6	100	6	0.03	2	100	0	0	0	0	2	0	1
218 Exterior	188	94	4	2	8	4	200	5	50	5	50	10	0.05	1	50	1	50	0	0	2	0	0
TOTAL	371	93	5	1	24	6	400	5	31	11	69	16	0.04	3	75	1	25	0	0	4	0	0
Feature 14 AA																						
200 C'	189	95	6	3	5	3	200	9	50	9	50	18	0.09	0	0	0	0	0	0	0	2	0
211 D'	196	98	1	1	3	2	200	8	15	44	85	52	0.26	2	100	0	0	0	0	2	0	0
TOTAL	385	96	7	2	8	2	400	17	24	53	76	70	0.18	2	100	0	0	0	0	2	2	0
Feature 14 BB																						
221 P'	198	99	1	1	1	1	200	7	50	7	50	14	0.07	0	0	0	0	0	0	0	2	0
222 X'	200	100	0	0	0	0	200	27	27	72	73	99	0.50	0	0	0	0	0	0	0	1	0
223 H' & HH	198	99	2	1	0	0	200	23	61	15	39	38	0.19	0	00	0	0	0	0	0	0	0
224 B'	198	99	0	0	2	1	200	1	9	10	91	11	0.06	0	0	0	0	0	0	0	3	0
TOTAL	794	99	3	1	3	1	800	58	36	104	64	162	0.20	0	00	0	0	0	0	0	6	0
Feature 15																						
201 J	174	87	8	4	18	9	200	1	11	8	89	9	0.05	2	67	1	33	0	0	3	2	0
205 T	175	88	4	2	21	11	200	1	17	5	83	6	0.03	0	0	2	100	0	0	2	0	2
TOTAL	349	87	12	3	39	10	400	2	13	13	87	15	0.04	2	40	3	60	0	0	5	2	2
Excavation Area 2																						
215 149-150S/195-196E Level C	187	94	3	2	10	5	200	7	44	9	56	16	0.08	1	100	0	0	0	0	1	2	0
214 149-150S/195-196E Level D	198	99	1	1	1	1	200	9	60	6	40	15	0.08	0	0	0	0	0	0	0	0	0
TOTAL	385	96	4	1	11	3	400	16	52	15	48	31	0.08	1	100	0	0	0	0	1	2	0

result in the deposition of nongrass types, tending to confirm the "hearth" interpretation. Festucoid bodies make up over 95% of those identified in Feature 14AA and 14BB, while nongrass phytoliths are relatively frequent (15% and 17%, respectively).

In sum, the paleoethnobotanical identification from sites 38BK235 and 38BK236 are informative and suggestive. Although the data are insufficient to discriminate between the two sites in terms of subsistence strategies, the data do suggest that Woodland period inhabitants of site 38BK236 gathered a wide range of plants for food and fuel. Abundance of dogwood, and the presence of hickory, walnut, acorn, persimmon, and grape, indicate together that gathering was done in the late summer and fall. No evidence for the use of cultivated plants was found, nor was there any indication of swamp zone utilization.

The data from site 38BK235 also reveal gathering/collecting activities taking place in the summer and fall. Small amounts of maize were recovered, and Magnoliacea wood is absent from the collections.

Osteological Analysis

Two principal research questions were to be addressed by analysis of the bones from site 38BK235. (No bones were recovered from site 38BK236.) First, the composition and distribution of the osteological remains at the site could help form a model of the environment at the time of human occupation at the site, and support or disconfirm the hypothesis developed in Chapter 2. Second, some of the bone recovered during excavations at 38BK235 appeared to be human, although it was fragmented and severely burned. Because little is known from historic and ethnographic sources about human burial practices in the South Carolina Coastal Plain, it was important to obtain as much information as possible from the bones. It was then planned to submit some of the bone for C-14 dating. The uniqueness of the recovered bones, and the impracticability of their being used for a C-14 determination could scarcely have been anticipated. In this section the findings of the osteological analysis are summarized.

Methods

The osteological materials were sent for analysis to Sarah Neusius at the American Archaeology Division, University of Missouri, Columbia. The bone fragments were sorted, washed as necessary, and identified using the comparative skeletal collection at the University of Missouri. Analysis proceeded according to the Minimum Number of Specimens (Payne 1972) and Minimum Number of Individuals (White 1953) techniques.

Results

Of 119,810 fragments, only 1,104--just less than 1%--could be identified to family, genus, or species (refer to Tables 36-44). Almost all of the bones were very small, burned fragments. Less than 1% could be confidently classified as unburned.

Block Excavation 1 (Fig. 7), containing Features 1-12, yielded human bone as well as the bones of unidentifiable birds and medium-to-large mammals. The five fragments of bone from Block Excavation 2 are from unidentifiable medium-to-large mammals.

By far the most abundant area of bone remains was Block Excavation 4, Feature 14BB containing more skeletal material (101,990 fragments) than all other parts of the site combined. By contrast, Feature 14AA yielded only 2,247 fragments, including only two bones identified as human, the rest being bird and medium-to-large mammal.

Homo sapiens and probable Homo sapiens are the most commonly identified taxa in Feature 14BB proper (not counting the subfeatures; refer to Fig. 15). The majority of the human bones, representing at least 16 individuals, are cranial elements, while most postcranial elements are from the hands and feet. The bones are so thoroughly burned that almost no age and sex determinations can be made. At least two adolescents and one individual of about 35 years are represented. Other taxa represented are deer, dog, turkey, box turtle, and aquatic turtles. Again, most indeterminate bones are of bird or medium-to-large mammal.

Human bones dominate in nearly all areas denoted as subfeatures (see Figure 15). Subfeature T' contains at least six human individuals, and Y' at least nine. Considering all 14BB subfeatures, at least 42 humans are represented in this part of Excavation Area 4. Hematite and limonite are associated with some of the subfeatures containing human bone.

In sum, the animal bones indicate the exploitation of the forest, including both upland and aquatic zones, with presence of deer, turkey, raccoon, and both box and aquatic turtles. The human bones have been burned, but not in situ. They apparently were burned elsewhere, then deposited in discrete areas, mainly within Feature 14BB. Burned bones of other animals are found mixed with those of humans.

The degree of burning of the bones was not appreciated until they were submitted for radiocarbon dating. Personnel at the University of Georgia radiocarbon dating laboratory report that almost no collagen is left in the bones, making them useless for dating purposes. It is speculated that the bones were burned at such a high temperature that nearly all of the carbon content was driven off (D.F. Smith 1981). Interestingly, Neusius believes the bones from site 38BK235 to have been burned when green (see Ubelaker 1978: 35-36 for a discussion of ways to distinguish bone burned when fresh from bone burned when dry).

Palynological Analysis

To shed further light on the paleoenvironment of the Santee River area over the past 3,000 years, Michael Andrejko, Department of Geology, University of South Carolina, Columbia, analyzed 50 sediment samples from 38BK235 for their pollen content.

TABLE 36

DISTRIBUTION OF BURNED FRAGMENTS AT 38BK235

	Burned		Possibly Burned		Unburned		Total
Feature 1	35	(97%)	1	(3%)	0		36
Feature 2	2	(100%)			0		2
Feature 4	21	(44%)	27	(56%)	0		48
Feature 5	989	(73%)	362	(27%)	3	(<1%)	1354
Feature 6	599	(80%)	87	(12%)	64	(9%)	750
Feature 7	9	(100%)	0		0		9
Feature 10	37	(100%)	0		0		37
Excavation Area 1 Squares	628	(73%)	236	(27%)	2	(<1%)	866
Total Excavation Area 1	2320	(75%)	713	(23%)	69	(2%)	3102
Excavation Area 2	5	(100%)	0		0		5
Feature 14AA	1469	(65%)	778	(35%)	0		2247
Feature 14BB	67328	(66%)	34348	(34%)	314	(<1%)	101990
Feature 14 Surface	13	(14%)	81	(86%)	0		94
Feature 14 Provenience Unknown	1840	(100%)	0		0		1840
Excavation Area 4 Squares	4350	(72%)	1703	(28%)	2	(<1%)	6055
Total Excavation Area 4	75000	(67%)	36910	(33%)	316	(<1%)	112226
General Surface	4	(40%)	6	(60%)	0		10
Unknown	3227	(72%)	1257	(28%)	15	(<1%)	4499
Total	80556	(67%)	38886	(33%)	400	(<1%)	119842

TABLE 37

DISTRIBUTION OF IDENTIFIED REMAINS AT 38BK235

	Homo sapiens	cf Homo sapiens	Odocoileus virginianus	cf Odocoileus virginianus	cf Canis familiaris	Canis spp.	Canidae	Procyon lotor	Meleagris gallopavo	cf Meleagris gallopavo	Terrapene spp.	Pseudemys Chrysemys Graptemys spp.	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 1															1 100%	1 100%
Feature 2																0
Feature 4																0
Feature 5	7 21%	26 79%														33 100%
Feature 6	6 50%	6 50%														12 100%
Feature 7																0
Feature 10																0
Excavation Area One Squares	4 36%		7 64%													11 100%
Total Excavation Area One	17 30%	32 57%		7 13%											1 2%	57 100%
Excavation Area 2																0

TABLE 37 (Cont.)

	Homo sapiens	cf Homo sapiens	Odocoileus virginianus	cf Odocoileus virginianus	cf Canis familiaris	Canis spp.	Canidae	Procyon lotor	Meleagris gallopavo	cf Meleagris gallopavo	Terrapene spp.	Pseudemys, Chrysemys, Graptemys spp.	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14AA	1 50%	1 50%														1 100%
Feature 14BB	489 52%	293 31%	11 1%	1 <1%	3 <1%	12 1%	12 1%	1 <1%	4 <1%	6 <1%	10 1%	14 1%	91 10%	1 <1%		948 100%
Feature 14 Surface																0
Feature 14 Unknown	13 100%															13 100%
Excavation Area Four Squares	19 38%	30 60%				1 2%										50 100%
Total Excavation Area 4	522 52%	324 32%	11 1%	1 <1%	3 1%	13 1%	12 1%	1 <1%	4 <1%	6 1%	10 1%	14 1%	9 1%	1 <1%		1013 100%
General Surface		1 100%														1 100%
Unknown	28 85%	5 15%														33 100%
Total	567 51%	362 33%	11 1%	8 1%	3 <1%	13 1%	12 1%	1 <1%	4 <1%	6 1%	10 1%	14 1%	91 8%	1 <1%	1 <1%	1104 100%

TABLE 38

DISTRIBUTION OF HOMO SAPIENS ELEMENTS AT 38BK235

	Cranial		Hands & Feet		Other Postcranial	
Feature 1	-		-		-	
Feature 2	-		-		-	
Feature 4	-		-		-	
Feature 5	7(32)*	100%(97%)	-		(1)	(3%)
Feature 6	5(11)	83%(92%)	-		1(1)	17%(8%)
Feature 7	-		-		-	
Feature 10	-		-		-	
Excavation Area 1 Squares	4(4)	100%(100%)	-		-	
Total Excavation Area 1	16(47)	94%(96%)	-		1(2)	6%(4%)
Excavation Area 2	-		-		-	
Feature 14AA	2(2)	100%(100%)	-		-	
Feature 14BB	333(571)	68%(73%)	105(127)	21%(16%)	51(84)	10%(11%)
Feature 14 Surface	-		-		-	
Feature 14 Unknown	10(10)	77%(77%)	3(3)	23%(23%)	-	
Excavation Area 4 Squares	16(41)	80%(84%)	4(7)	20%(14%)	(1)	(2%)
Total Excavation Area 4	359(624)	69%(74%)	112(137)	21%(16%)	51(85)	10%(10%)
General Surface	(1)	(100%)	-		-	
Unknown	17(17)	61%(51%)	7(8)	25%(24%)	4(8)	14%(24%)
Total	392(689)	69%(74%)	119(145)	21%(16%)	56(95)	10%(10%)

* Includes cf *Homo sapiens*

TABLE 39

DISTRIBUTION OF MINIMUM NUMBERS OF INDIVIDUALS AT 38BK235

	H. sapiens	O. virginianus	cf C. familiaris	Canis spp.	Canidae	P. lotor	M. gallapavo	Terrapene spp.	Pseudemys Graptemys Chrysemys spp.	Emydidae	cf Kinostanidae	Viperidae	Total
Feature 1												1 100%	1 100%
Feature 2													0
Feature 4													0
Feature 5	2 100% (2) (100%)												2 100% (2) (100%)
Feature 6	2 100% (2) (100%)												2 100% (2) (100%)
Feature 7													0
Feature 10													0
Excavation Area One Squares	1 100% (1) (50%)	(1) (50%)											1 100% (2) (100%)
Excavation Area One Total	3 75% (3) (60%)	(1) (20%)										1 25% (1) (25%)	4 100% (5) (100%)
Excavation Area Two													0
Feature 14AA	1 100% (1) (100%)												1 100% (1) (100%)
Feature 14BB	16 62% (17) (59%)	1 4% (1) (3%)	(1) (3%)	1 4% (1) (3%)	1 4% (1) (3%)	1 4% (1) (3%)	3 12% (3) (10%)	1 4% (1) (3%)	1 4% (1) (3%)	1 4% (1) (3%)	(1) (3%)		26 100% (29) (100%)
Feature 14 Surface													0
Feature 14 Unknown	1 100% (1) (100%)												1 100% (1) (100%)
Excavation Area Four Squares	2 100% (2) (100%)												2 100% (2) (100%)
Total Excavation Area 4	18 64% (20) (63%)	1 4% (1) (3%)	(1) (3%)	1 4% (1) (3%)	1 4% (1) (3%)	1 4% (1) (3%)	3 11% (3) (9%)	1 4% (1) (3%)	1 4% (1) (3%)	1 4% (1) (3%)	(1) (3%)		28 100% (32) (100%)
General Surface	(1) (100%)												(1) (100%)
Unknown	4 100% (4) (100%)												4 100% (4) (100%)
Total	20 65% (21) (62%)	1 [illegible] (1) (3%)	(1) (3%)	1 3% (1) (3%)	1 3% (1) (3%)	1 3% (1) (3%)	3 10% (3) (9%)	1 3% (1) (3%)	[illegible]	[illegible] 3% [illegible]) (3%)	(1) (3%)	1 3% (1) (3%)	31 100% (34) (100%)

TABLE 40

DISTRIBUTION OF INDETERMINATE REMAINS AT 38BK235

	Medium/Large Mammal	Medium/Small Mammal	Small Mammal	Indeterminate Mammal	Bird/Mammal	Bird	Turtle	Indeterminate Vertebrate	cf Marine Mollusk	Total
Feature 1	33 94%		2 6%							35 100%
Feature 2								2 100%		2 100%
Feature 4	46 96%		2 4%							48 100%
Feature 5	1292 98%	5 <1%	1 <1%	17 1%	3 <1%		1 <1%	2 <1%		1321 100%
Feature 6	622 90%	17 2%	5 1%	52 7%	1 <1%			1 <1%		738 100%
Feature 7	6 67%			2 22%	1 11%					9 100%
Feature 10	37 100%									37 100%
Excavation Area 1 Square	760 90%			81 10%	3 1%					845 100%
Total Excavation Area 1	2836 94%	22 2%	10 1%	152 15%	8 1%		1 <1%	5 1%	1 <1%	1035 100%
Excavation Area 2	5 100%									5 100%

TABLE 40 (Cont.)

DISTRIBUTION OF INDETERMINATE REMAINS AT 38BK235

	Medium/Large Mammal	Medium/Small Mammal	Small Mammal	Indeterminate Mammal	Bird/Mammal	Bird	Turtle	Indeterminate Vertebrate	cf Marine Mollusk	Total
Feature 14AA	2233 100%		9 <1%			3 <1%				2245 100%
Feature 14BB	97962 97%	21 <1%	117 <1%	2810 3%	56 <1%	80 <1%	8 <1%			101054 100%
Feature 14 Surface	94 100%									94 100%
Feature 14 Unknown	1826 100%									1826 100%
Excavation Area 4 Square	5890 98%		5 <1%	107 2%	2 <1%		1 <1%			6005 100%
Total Excavation Area 4	108005 97%	21 <1%	131 <1%	2917 3%	58 <1%	83 <1%	9 <1%			111224 100%
General Surface	9 100%									9 100%
Unknown	4407 99%		4 <1%	51 1%	2 <1%			1 <1%		4465 100%
Total	115262 97%	43 <1%	145 <1%	3120 3%	68 <1%	83 <1%	10 <1%	6 <1%	1 <1%	118738 100%

TABLE 41

DISTRIBUTION OF IDENTIFIED REMAINS WITHIN FEATURES 14AA AND 14BB

	Homo sapiens	cf Homo sapiens	Odocoileus virginianus	cf Odocoileus virginianus	cf Canis familiaris	Canis spp	Canidae	Procyon lotor	Meleagris gallopavo	cf Meleagris gallopavo	Terrapene spp	Pseudemys Graptemys Chrysemys spp.	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14AA --- A'																0
C'																0
D'																0
C	1 50%	1 50%														2 100%
Other Areas																0
Total Feature 14AA	1 50%	1 50%														2 100%
Feature 14BB --- E'	1 100%															1 100%
F'	7 47%	8 53%														15 100%
G'	1 100%															1 100%
H'	31 49%	3 5%	8 13%						4 6%	4 7%	13 21%					63 100%
H'+HH		1 100%														1 100%

TABLE 41 (Cont.)

DISTRIBUTION OF IDENTIFIED REMAINS WITHIN FEATURES 14AA AND 14BB

	Homo sapiens	cf Homo sapiens	Odocoileus virginianus	cf Odocoileus virginianus	cf Canis familiaris	Canis spp	Canidae	Procyon lotor	Meleagris gallopavo	cf Meleagris gallopave	Terrapene spp	Pseudemys Graptemys Chrysemys spp	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14BB --- HH	2 100%															2 100%
I'	3 33%	6 67%														9 100%
K'																0
KK																0
L'	1 20%	4 80%														5 100%
M'	8 100%															8 100%
N'	3 100%															3 100%
O'	2 100%															2 100%
PP	8 100%															8 100%
P'	5 100%															5 100%
Q'		2 100%														2 100%
R'		1 100%														1 100%

TABLE 41 (Cont.)

	Homo sapiens	cf Homo sapiens	Odocoileus virginianus	cf Odocoileus virginianus	cf Canis familiaris	Canis spp	Canidae	Procyon lotor	Meleagris gallopavo	cf Meleagris gallopavo	Terrapene spp	Pseudemys, Graptemys, Chrysemys spp	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14BB --- S'	2 100%															2 100%
T'	150 69%	44 20%			3 1%	11 5%	7 3%					1 <1%				216 100%
U'	10 33%	20 67%														30 100%
V'	3 43%	3 43%							1 14%							7 100%
V	3 100%															3 100%
W	8 15%	43 80%											3 6%			54 100%
W'	8 67%	3 25%											1 8%			12 100%
X'																0
X	11 22%	38 78%														49 100%
Y'	128 65%	37 19%									1 1%		28 14%			194 100%
Other Areas	94 37%	80 31%	3 1%	1 <1%		1 <1%	5 2%			2 1%	9 4%	1 <1%	58 23%	1 <1%		255 100%
Total Feature 14BB	489 52%	293 31%	11 1%	1 <1%	3 <1%	12 1%	12 1%	1 <1%	4 <1%	6 <1%	10 1%	14 1%	91 10%	1 <1%		948 100%

TABLE 42

DISTRIBUTION OF *HOMO SAPIENS* ELEMENTS WITHIN FEATURES 14AA AND 14BB

		Cranial		Hands & Feet		Other Postcranial	
Feature 14AA -----	A'	-		-		-	
	C'	-		-		-	
	D'	-		-		-	
	C	2(2)	100%(100%)	-		-	
	Other areas	-		-		-	
	Total Feature	2(2)	100%(100%)	-		-	
Feature 14BB -----	E'	1(1)	100%(100%)	-		-	
	F'	4(8)	57%(53%)	2(2)	29%(13%)	1(5)	14%(33%)
	G'	-		1(1)	100%(100%)	-	
	H'	21(23)	68%(68%)	8(9)	26%(27%)	2(2)	6%(6%)
	H' + HH	(1)	(100%)	-		-	
	HH	1(1)	50%(50%)	1(1)	50%(50%)	-	
	I'	3(3)	100%(33%)	(5)	(55%)	(1)	(11%)
	K'	-		-		-	
	KK	-		-		-	
	L'	1(3)	100%(60%)	-		(2)	(40%)
	M'	7(7)	88%(88%)	1(1)	13%(13%)	-	
	N'	2(2)	67%(67%)	1(1)	33%(33%)	-	
	O'	-		2(2)	100%(100%)	-	

*Figures in parentheses include cf *Homo sapiens* fragments

TABLE 42 (Cont.)

DISTRIBUTION OF HOMO SAPIENS ELEMENTS WITHIN FEATURES 14AA AND 14BB

		Cranial		Hands & Feet		Other Postcranial	
Feature 14BB -----	PP	7(7)	88%(88%)	1(1)	13%(13%)	-	
	P'	5(5)	100%(100%)	-		-	
	Q'	(2)	(100%)	-		-	
	R'	(1)	(100%)	-		-	
	S'	2(2)	100%(100%)	-		-	
	T'	95(135)	63%(70%)	35(35)	23%(18%)	20(24)	13%(12%)
	U'	8(25)	80%(83%)	1(2)	10%(6%)	1(3)	10%(10%)
	V'	2(3)	67%(50%)	1(3)	33%(50%)	-	
	V	1(1)	33%(33%)	-		2(2)	67%(67%)
	W	8(51)	100%(100%)	-		-	
	W'	5(7)	63%(64%)	3(4)	38%(36%)	-	
	X'	-		-		-	
	X	11(48)	100%(98%)	-		(1)	(2%)
	Y'	83(110)	65%(67%)	29(33)	23%(20%)	16(22)	13%(13%)
	Other Areas	66(125)	70%(72%)	19(27)	20%(16%)	9(22)	10%(13%)
	Total Feature	333(571)	68%(73%)	105(127)	22%(16%)	51(84)	10%(11%)

*Figures in parentheses include cf Homo sapiens fragments

TABLE 43

DISTRIBUTION OF MINIMUM NUMBERS OF INDIVIDUALS
WITHIN FEATURES 14AA AND 14BB

	Homo sapiens	Odocoileus virginianus	cf Canis familiaris	Canis spp	Canidae	Procyon lotor	Meleagris gallopavo	Terrapene spp	Pseudemys Chrysemys Graptemys spp	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14AA --- A'													0
C'													0
D'													0
C	1 100% (1) (100%)												1 100% (1) (100%)
Other Areas													0
Total Feature 14AA	1 100% (1) (100%)												1 100% (1) (100%)
Feature 14BB --- E'	1 100% (1) (100%)												1 100% (1) (100%)
F'	1 100% (2) (100%)												1 100% (2) (100%)
G'	1 100% (1) (100%)												1 100% (1) (100%)
H'	2 33% (2) (29%)	1 16% (1) (14%)					2 33% (3) (43%)		1 16% (1) (14%)				6 100% (7) (100%)
H'+HH	0 (1) (100%)												0 (1) (100%)

*Numbers in parentheses included cf Homo sapiens

TABLE 43 (Cont.)

DISTRIBUTION OF MINIMUM NUMBERS OF INDIVIDUALS
WITHIN FEATURES 14AA AND 14BB

	Homo sapiens	Odocoileus virginianus	cf Canis familiaris	Canis spp	Canidae	Procyon lotor	Meleagris gallopavo	Terrapene spp	Pseudemys Chrysemys Graptemys spp	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14BB --- I'	1 100% (1)(100%)												0
K'													0
KK													0
L'	1 100% (1)(100%)												1 100% (1)(100%)
M'	2 100% (2)(100%)												2 100% (2)(100%)
N'	1 100% (1)(100%)												1 100% (1)(100%)
O'	1 100% (1)(100%)												1 100% (1)(100%)
PP	1 100% (1)(100%)												1 100% (1)(100%)
P'	1 100% (1)(100%)												1 100% (1)(100%)
Q'	0 (1)(100%)												0 (1)(100%)
R'	0 (1)(100%)												0 (1)(100%)
S'	1 100% (1)(100%)												1 100% (1)(100%)

TABLE 43 (Cont.)

DISTRIBUTION OF MINIMUM NUMBERS OF INDIVIDUALS
WITHIN FEATURES 14AA AND 14BB

	Homo sapiens	Odocoileus virginianus	cf Canis familiaris	Canis spp	Canidae	Procyon lotor	Meleagris gallopavo	Terrapene spp	Pseudemys Chrysemys Graptemys spp	Emydidae	cf Kinosternidae	Viperidae	Total
Feature 14BB --- T'	6 67% (6) (60%)		0 (1) (10%)	1 11% (1) (10%)	1 11% (1) (10%)					1 11% (1) (10%)			9 100% (10) (100)
U	2 100% (3) (100%)												2 100% (3) (100%)
V'	1 50% (1) (50%)					1 50% (1) (50%)							2 100% (2) (100%)
V	2 100% (2) (100%)												2 100% (2) (100%)
W	0 (1) (100%)												1 100% (1) (100%)
W'	1 100% (1) (100%)												1 100% (1) (100%)
X'													0
X	2 100% (2) (100%)												2 100% (2) (100%)
Y'	9 82% (9) (82%)							1 9% (1) (9%)		1 9% (1) (9%)			11 100% (11) (100%)
Other Areas	4 40% (5) (42%)	1 10% (1) (8%)		1 10% (1) (8%)	1 10% (1) (8%)		1 10% (1) (8%)	1 10% (1) (8%)	1 10% (1) (8%)		0 (1) (8%)		10 100% (12) (100%)
Total Feature 14BB	42 71% (49) (71%)	2 3% (2) (3%)	0 (1) (1%)	2 3% (2) (3%)	2 3% (2) (3%)	1 2% (1) (1%)	3 5% (4) (6%)	2 3% (2) (3%)	2 3% (2) (3%)	3 5% (3) (4%)	0 (1) (1%)		59 100% (69) (100%)

TABLE 44

DISTRIBUTION OF INDETERMINATE REMAINS WITHIN FEATURES 14AA AND 14BB

	Medium/Large Mammal	Medium/Small Mammal	Small Mammal	Indeterminate Mammal	Bird/Mammal	Bird	Turtle	Indeterminate Vertebrate	cf Marine Mollusk	Total
Feature 14AA --- A'	13 100%									13 100%
C'	1405 100%									1405 100%
D'	6 100%									6 100%
C	735 98%		9 1%		3 <1%					747 100%
Other Areas	74 100%									74 100%
Total Feature 14AA	2233 99%		9 <1%		3 <1%					2245 100%
Feature 14BB --- E'	228 100%									228 100%
F'	1936 98%				42 2%					1978 100%
G'	927 100%									927 100%
H'	4884 98%		4 <1%		8 <1%	61 1%	6 <1%			4963 100%
H'+HII	169 100%									169 100%
HII	680 97%		21 3%							701 100%

TABLE 44 (Cont.)

DISTRIBUTION OF INDETERMINATE REMAINS WITHIN FEATURES 14AA AND 14BB

	Medium/Large Mammal	Medium/Small Mammal	Small Mammal	Indeterminate Mammal	Bird/Mammal	Bird	Turtle	Indeterminate Vertebrate	cf. Marine Mollusk	Total
Feature 14BB --- I'	2571 100%	1 <1%								2572 100%
K'	43 88%			6 12%						49 100%
KK	196 96%		4 2%	5 2%						205 100%
L'	1399 96%			47 3%	2 <1%					1448 100%
M'	549 100%									549 100%
N'	490 100%									490 100%
O'	1168 94%			74 6%						1242 100%
PP	920 100%		4 <1%							924 100%
P'	931 100%									931 100%
Q'	302 96%			14 4%						316 100%
R'				1628 100%						1628 100%
S'	244 100%									244 100%

TABLE 44 (Cont.)

DISTRIBUTION OF INDETERMINATE REMAINS WITHIN FEATURES 14AA AND 14BB

	Medium/Large Mammal	Medium/Small Mammal	Small Mammal	Indeterminate Mammal	Bird/Mammal	Bird	Turtle	Indeterminate Vertebrate	cf Marine Mollusk	Total
Feature 14BB --- T'	17036 100%	1 <1%	32 <1%	13 <1%						17082 100%
U'	2588 97%			93 .3%						2681 100%
V'	2186 100%									2186 100%
V	1530 100%									1530 100%
W	1487 100%									1487 100%
W'	2543 85%		2 <1%	439 15%						2984 100%
X'	27 100%									27 100%
X	4699 100%		13 <1%							4712 100%
Y'	14738 100%	5 <1%	7 <1%	44 <1%		9 <1%				14803 100%
Other Areas	31258 98%	14 <1%	21 <1%	447 <1%	1 <1%	10 <1%	2 <1%			31753 100%
Total Feature 14BB	97962 97%	21 <1%	117 <1%	2810 3%	56 <1%	80 <1%	8 <1%			101054 100%

Methods

The samples were treated with hydrocloric acid and washed in deionized water, then dissolved in 52% hydrogen fluoride for 2-3 days. The residue was subjected to zinc chloride flotation to separate the organic materials, then these were oxidized in sodium hypochlorite, washed, and treated with 5% potassium hydroxide. Slides were prepared, then observed under magnification of 400X.

Results

Countable pollen was observed only in 2 of the 50 samples. These two revealed only *Pinus* sp. (pine) and *Quercus* sp. (oak). No statistical analyses can be performed meaningfully due to the fact that counts on both slides were less than 50 total palynomorphs.

In view of the fact that a high percentage of the sediment grains are sand-sized or larger, Andrejko believes that it is likely that much of the organic material, including the palynomorphs, was removed through percolation. If this is true, it may be possible to find pollen accumulated above the substrate and below the upper soil horizons in similar situations. Such samples should be collected to test this possibility at the next opportunity.

Soil Chemical Analysis at 38BK235

Soil chemical analyses were undertaken to add further data on the nature and possible functions of certain features at 38BK235 (for a brief discussion of phosphorous analysis in archeology, see Sjoberg 1975). Specifically, tests were run by Alf Sjoberg at the Laboratory for Archaeological Soils Chemistry, University of North Carolina, Chapel Hill, for acidity (pH), grain size, phosphorous content, and calcium content.

Methods

Acidity was measured in 0.01 $CaC1_2$, according to the method of Peech (1965).

Grain-size analysis was carried out first by dry sieving to separate coarse from fine particles, then using a sedimentation pipette, with water as the medium.

Samples for total phosphorous and calcium counts were prepared in the following manner. One-half gram of the sample was digested in an equal mixture of perchloric acid and nitric acid placed in an aluminum heating block such as that constructed by Blanchar, Rehm, and Caldwell (1965). The nitric acid was then boiled off at a temperature of 170^{o} C, which was then increased to 225^{o} C and allowed to boil for one hour. The sample volume after digestion was diluted to 50 ml with distilled water, stirred, and left to rest for 12 hours.

Total phosphorous was extracted by combining the molybdenum blue methods of Murphy and Riley (1962) and Frei, Peyer, and Schutz (1964). The absorbance was read on a Spectronic 20 colorimeter at 740 nm.

Total calcium with an addition of lanthanum was measured on a Perkin-Elmer Model 303 atomic absorption spectrophotometer (Data Supplement V).

Results

As expected, the soil is acidic, averaging pH = 5.00.

Sand is the dominant constituent in the sediment averaging slightly over 80%. Gravel accounts for 5.2%, with silt and clay-sized particles making up the remainder.

Total phosphorous (P) and total calcium (Ca) content are given in parts per million (ppm); that is, 10,000 ppm = 1%. In the types of soils present in the research area, inherent amounts of phosphorous may be expected to vary between 100 and 400 ppm, and calcium between 700 and 4,000 ppm.

Generally speaking, there is little variation among the 100 samples analyzed from site 38BK235 (Table 45). A few of the notable exceptions can be described briefly here.

The red lens recorded in square 158-159S/298-299E (Feature 1) is high in P and in Ca, averaging 910 and 8,053 ppm, respectively.

Feature 7 is generally low in P and Ca, with the exception of subfeature R (see Fig. 10).

Feature 9 is high in Ca (8,065 ppm), but low in P (740 ppm). This finding is anomalous in view of the fact that no bones were found in Feature 9.

Feature 5 shows P and Ca concentrations typical of burials (1,460 and 22,150, respectively); Neusius (Data Supplement II) reports that at least two humans are represented in Feature 5.

By far the highest P and Ca values are observed in Block Excavation 4. In Feature 14AA, high phosphorous (885 ppm) is found in subfeature D', but a relatively low calcium count (5,360 ppm) is observed. This would tend to indicate that if this were a storage pit, then probably vegetal rather than animal matter was stored within it. Interestingly, Feature 14AA subfeature A', thought to be a postmold during fieldwork, is chemically (P = 990 ppm; Ca = 15,055 ppm) unlike the other postmolds. A glance at the map (Fig. 15) shows that A' is not consistent with the roughly circular postmold pattern. In fact, A' is chemically similar to subfeatures C' and B'. Neusius (Data Supplement II) identified burned human bone in subfeature C'.

Feature 14BB, as might be expected, contains high quantities of P and Ca. Samples from Feature 14BB's subfeatures L', V', X', J', and P' are all high in P and Ca (averaging 954 and 15,105 ppm, respectively). All of these except X' contain identifiable human bones. Pearsall and Voigt (Data

TABLE 45

RESULTS OF ANALYSES FOR PH, PHOSPHOROUS, AND CALCIUM
SOURCE: (DATA SUPPLEMENT V)

#	Grid Location	Provenience	Elevation	P	CA	pH (every 10th sample)
1	190/305	15J	1.86-1.95	525	3155	4.9
2	185/305	15T	1.88-1.98	490	4010	
3	213/331	13	interior	460	4800	
4	213/331	13	exterior	515	4755	
5	158-9/298-9	1	1.91-2.07	775	6320	
6	158-9/298-9	1, 25-30 cm	red lens	950	8150	
7	158-9/298-9	1, 25-30 cm	red lens	870	7955	
8	149-0/195-6	L.C, 20-30 cm	balk	520	4150	
9	149-0/195-6	L.C, 30-40 cm	balk	610	5275	
10	157-8/298-9	F. 7P	1.78-1.83	925	9025	4.7
11	160-1/299-0	F. 7R	1.89-1.94	1105	11010	
12	157-8/299-0	F. 7G	1.77-1.85	655	6015	
13	158-9/298-9	F. 7Y	1.91-2.00	720	7155	
14	158-9/295-6	F. 7KK	1.80-1.90	560	6910	
15	161-2/300-1	F. 7XX	1.83-1.88	615	7115	
16	160-1/296-7	F. 7DDD	1.85-1.88	490	5355	
17	155-6/297-8	F. 7E	1.77-1.82	590	5460	
18	158-9/300-1	F. 7M	1.81-1.87	585	5455	
19	156-7/292-3	F. 7B	1.83-1.87	610	6855	
20	162-3/296-7	F. 7ZZ	1.80-1.85	645	4955	5.1
21	147-8/299-0	F. 5	20-30cm	1460	22150	
22	156-7/298-9	F. 9	1.80-1.89	740	8065	
23	161-2/299-0	L. C	1.80-1.84	650	6830	
24	162-3/297-8	L. C	1.81-1.86	595	4915	
25	158-9/290-1	L. C	1.82-1.87	480	4240	
26	158-9/298-9	L. C	1.91	760	8155	
27	153-4/292-3	L. C	1.77-1.85	480	3950	
28	162-3/302-3	-	1.81-1.85	505	4165	
29	158-9/289-0	L. C	1.84-1.88	530	4235	
30	162-3/298-9	L. C	top	545	4350	5.3
31	161-2/298-9	L. C	1.82-1.85	570	4875	
32	155-6/291-2	L. C	-	495	3965	
33	161-2/302-3	-	1.82-1.85	490	3915	
34	153-4/298-9	L. C	1.79-185	470	3855	
35	161-2/300-1	-	-	590	4650	
36	155-6/297-8	L. C	1.78-1.85	545	4445	
37	158-9/293-4	-	1.79-1.85	605	5105	
38	155-6/291-2	L. C	1.80-1.85	430	4065	
39	154-5/296-7	L. C	1.78-1.85	500	4330	
40	152-3/295-6	L. C	1.82-1.88	470	4010	4.7
41	161-2/301-2	-	1.82-1.86	485	4095	
42	162-3/300-1	-	1.82-1.86	495	5005	
43	185-6/354-5	F. 14BB, L'	3.20-3.32	920	13900	
44	186-7/356-7	F. 14BB, V'	2.91-3.13	970	13365	

TABLE 45 (Cont.)

#	Grid Location	Provenience	Elevation	P	CA	pH (every 10th sample)
45	183-4/355-6	F. 14BB, N'	3.06-3.13	1005	16280	
46	184-5/355-6	F. 14BB, SF.X'	3.27-3.45	875	12850	
47	185-6/354-5	F. 14BB, SF.J'	3.10-3.20	845	14560	
48	184-5/356-7	F. 14BB, SF.P'	3.04-3.15	1110	19675	
49	185-6/359-0	F. 14AA, SF.C'	2.85-3.19	1385	11265	
50	185-7/361-4	F. 14AA, SF.D'	3.21-3.24	855	5360	5.2
51	161-2/300-1	C, F. 7	1.82-1.86	585	4780	
52	160-1/302-3	F. 7	1.83-1.88	505	4460	
53	161-2/301-2	C, F. 7	1.83-1.86	515	4180	
54	162-3/300-1	F. 7	1.82-1.87	480	4005	
55	161-2/296-7	C, F. 7	1.75-1.82	575	4580	
56	155-6/296-7	F. 7	1.84-1.85	585	4915	
57	157-8/296-7	C, F. 7	1.78-1.82	710	8030	
58	156-7/297-8	F. 7	1.78-1.84	645	7420	
59	160-1/295-6	C, F. 7	1.76-1.84	530	4915	
60	161-2/302-1	C, F. 7	1.82-1.86	520	4755	5.2
61	161-2/295-6	C, F. 7	1.75-1.86	540	4800	
62	161-2/296-7	C, F. 7	1.75-1.82	590	5005	
63	156-7/295-6	F. 7	1.77-	695	7010	
64	157-8/292-3	C, F. 7	1.80-1.85	440	3905	
65	162-3/296-7	C, F. 7	1.75-1.78	555	5165	
66	158-9/294-5	C, F. 7	1.77-1.81	660	5940	
67	160-1/294-5	C, F. 7	1.77-1.85	495	4520	
68	160-1/296-7	C, F. 7	1.76-1.84	580	4935	
69	157-8/291-2	C, F. 7	1.80-1.86	415	3805	
70	155-6/299-0	C, F. 7	1.78-	435	3960	4.9
71	155-6/294-5	C, F. 7	1.81-1.88	680	5875	
72	160-1/302-3	F. 7, outs.	1.82-1.86	495	4520	
73	155-6/289-0	F. 7, outs.	1.75-1.86	393	3515	
74	153-4/290-1	C, F. 7	1.82-1.88	290	2130	
75	162-3/301-2	F. 7	1.82-1.86	515	4660	
76	156-7/290-1	C, F. 7	1.85-1.87	365	3420	
77	153-4/289-0	C, F. 7	1.82-1.88	340	3190	
78	186-7/363-4	F. 14I	2.83-2.90	550	4950	
79	185-6/361-2	F. 14D	2.81-2.88	565	4995	
80	186-7/360-1	F. 14R	2.83-2.95	590	5230	4.8
81	185-6/362-3	F. 14F	2.82-2.87	515	5170	
82	187-8/362-3	F. 14L	2.83-2.95	585	5145	
83	184-5/356-7	F. 14PP	3.13-3.36	605	6750	
84	185-6/355-6	F. 14W'	-	995	10015	
85	185-6/355-6	F. 14K	3.20-3.36	853	9085	
86	185-6/354-5	F. 14KK	3.15-3.34	590	7275	
87	185-6/355-6	F. 14BB-QQ, fill b.	3.36-3.41	925	12885	
88	186-7/360-1	F. 14B'	2.90-3.08	860	11360	
89	185-6/357-8	L.A., 0-10 cm	2.99	490	3925	

TABLE 45 (Cont.)

#	Grid Location	Provenience	Elevation	P	CA	pH (every 10th sample)
90	185-6/356-7	F. 14BB, F'	3.07-3.20	830	9735	4.9
91	187-8/364-5	F. 14U	2.82-2.94	560	5330	
92	186-7/360-1	F. 14Q	2.83-2.92	590	5470	
93	184-5/360-1	F. 14A	2.80-2.92	575	5850	
94	184-5/360-1	F. 14B	2.81-2.97	510	5965	
95	186-7/360-1	F. 14S	2.81-2.92	495	5110	
96	187-8/363-4	F. 14K	2.82-2.87	545	5005	
97	184-5/356-7	F. 14O'	3.13-3.25	595	5365	
98	186-7/360-1	F. 14A'	2.94-3.22	990	15055	
99	185-6/356-7	F. 14H'+HH	3.16-3.31	690	7080	
100	185-6/357-8	F. 14E'	2.92-3.01	630	6825	5.2

Supplement I) found a relatively high number of nongrass phytoliths in X', and suggest that it might represent an ash dump.

Soil chemical information provides information tending to confirm the function of Feature 14AA subfeature D' as a storage pit, and to confirm the nature of burial pits such as the subfeatures in Feature 14BB and the more isolated burial areas, such as Feature 5 in Block Excavation Area 1 and subfeature C' of Feature 14AA. The low values of phosphorous in Feature 7 (see Fig. 10) again serve to discriminate it from the remainder of the site. Feature 1, the possible hearth within Feature 7, has a relatively low calcium count (6,320 ppm), tending to indicate for it a heating rather than a cooking function.

Summary

The preservation of archeological organic materials in a nonshell midden context on the South Carolina Coastal Plain is unusual indeed. Although flotation of the sandy matrix was time consuming, charred macrobotanical remains were obtained from the soil. The results of the analysis are useful in helping to confirm the season of site occupation and the nature of human subsistence in the Middle-Late Woodland and Mississippian periods. Further refinement of the flotation techniques specifically designed for the soils of the Coastal Plain may improve the rate of recovery of plant remains from future excavations. The Institute is presently using a SMAP machine (Watson 1976) instead of the modified water screening technique used in 1979 to recover macrobotanical remains from these sites.

Phytoliths are present in the sandy soils of the Coastal Plain and, with the caveat that interpretation must be cautious, their recovery and interpretation have contributed information complementary to that produced by the macrobotanical analysis.

Bone preservation is rare in the Coastal Plain, and one of the reasons for careful attention to site 38BK235 was the presence of relatively large quantities of burned bone. Although 99% of the bone cannot be identified to family, genus, or species levels, the analysis does provide supplementary paleoenvironmental and subsistence data, as well as insight into a pattern of treatment of the dead thus far unique in the South Carolina archeological record.

Analysis of total phosphorous and calcium present in the soil confirms feature interpretations, supplementing faunal, floral, and stratigraphic data. Soil chemical analysis is a valuable addition to the archeologist's interpretive arsenal. Considering that the phosphorous and calcium analyses together account for only one-half of one percent of the budget for the analysis, the technique must surely be reckoned cost-effective as well.

Pollen analysis and radiocarbon dating proved disappointing, for the reasons discussed above. Although palynomorphs are present in the samples, they are not found in quantities sufficient for reliable interpretation. The burned bone could not be dated due to the absence of sufficient carbon for dating any meaningful subsample.

Part II. Resource Variability and Functional Variability in Activity Areas: A Comparative Summary

Arguments of relevance concerning the greater resource variability, i.e., greater diversity and/or proportional representation of riverine resources, and better defined, more functionally distinct and variable activity areas expected at Mississippian riverine sites, as compared to Middle-Late Woodland riverine sites, have been detailed elsewhere (Chapter 2). Based on traditional interpretations of the data sets (the sites could not be dated due to insufficient data; see also Chapter 3), the major component at 38BK235 has been assigned to the Mississippian period and the major component at 38BK236 to the Middle-Late Woodland period for the purposes of this comparison.

Resource Variability

Based on the hypothesized intensive, year-round, or at least multi-seasonal habitation, the subsistence data from a Mississippian site should reflect a higher proportion of riverine-associated resources than subsistence data from a Middle-Late Woodland site. At a Middle-Late Woodland seasonal (riverine base?) camp, although similar species may be exploited, the intensity either in niche width or diversity should not be the same as expected at a Mississippian habitation site. Even though a wide variety of subsistence resources may have been consumed by the Middle-Late Woodland populations, the total range should be reflected at several seasonal sites, rather than one site.

The total number of identified remains from each site is roughly equal. The variety of species is equal to 12 in both assemblages. (The remains of Juglandaceae, identified at the family level, were not counted under the general family identification. Two of the Juglandaceae at 38BK235 are accounted for by Feature 11-12, which has been identified as a Middle-Late Woodland pit on the basis of pottery. Therefore, the total frequency of Juglandaceae, including the species specific identification of hickory [Carya spp.] for the Middle-Late Woodland assemblage is 5).

Although problems involving differential preservation affect botanical interpretation, the number of species, the types of species, and their proportional representation suggest profitable areas for refining hypotheses for future research. The number of species, i.e., species diversity, represented at each site is surprisingly the same. Because of the differences in the hypothesized settlement between the two sites, the total number of species exploited by Middle-Late Woodland populations could be higher than that exploited by Mississippian populations. If site 38BK236 represents a limited seasonal occupation, the total number of botanical resources exploited by Middle-Late Woodland populations may increase as additional remains are recovered from settlements representing other seasonal occupations. The recovery of additional species from Mississippian period sites that are limited or specialized extraction sites is not precluded, but if 38BK235 represents a multiseasonal or year-round occupation, the majority of subsistence species should be represented there.

This pattern would run contrary to Christenson's (1980: 49, 51) analysis of data from the Midwest, which showed that even with increased horticulture, which decreased the niche width, the total species diversity found in the Mississippian period is equal to and slightly higher than that of the Woodland period. It may be that the species diversity will remain approximately the same for the Middle-Late Woodland and Mississippian periods, because the summer and fall seasons in which flowering species would be available (and which are also better preserved) are heavily represented (Table 46; Chapter 7). At least one of the nuts, hickory, on which the Middle-Late Woodland populations were expected to focus in exploiting the interriverine zone during the fall, is also present.

All 12 species represented at 38BK236 are available from spring to early fall: herbs, tubers, greens, berries, seeds, and fruits. Habitation at 38BK236 may have occurred as early as the ripening of spring blackberries (Table 46). Significantly, there is a very small number of late fall (October) nut remains at 38BK236. Nuts, particularly charred nuts, should have one of the highest preservation ratios. By October, then, the Middle-Late Woodland populations may have moved to the upland interriverine zone to exploit nuts and deer.

Dogwood fruits and pine seeds are not listed as known subsistence items for the late prehistoric period in the Eastern Woodland (Canouts 1971; Swanton 1946; Yarnell 1964). Pine seeds were used as staples in the Far West and Southwest. Dogwood fruit can probably be eaten in small quantities without ill effect (Herbarium, University of South Carolina). While only five dogwood and no pine fragments were identified at 38BK235, dogwood and pine together represent 78% of the assemblage at 38BK236. Certain species of dogwood (Cornus stricta) and pine (Pinus serotina and Pinus strobus) are available as early as August. If present in a subsistence context and not due to contaminated samples, these species may have been used in an attempt to extend the Middle-Late Woodland riverine occupation context and not due to contaminated samples, these species may have been used in an attempt to extend the Middle-Late Woodland riverine occupation until time to move into the upland zone for the late fall exploitation of nuts and deer.

The differences in types and proportions of species between the two sites are very interesting (Table 46). Christenson's (1980: 49) Midwestern data base does suggest that the types of plants represented should be different, with more seed species present in the Woodland periods and higher numbers of different types of fruits, nuts, and cultigens in the Mississippian. Seed species in the Mississippian assemblage include Chenopodium spp., Galium spp., Gramineae, and Leguminosae. In the Midwest, Chenopodium spp. (goosefoot) was intensively harvested and perhaps cultivated during the Middle Woodland period (Asch, Farnsworth, and Asch 1979). It grows well in disturbed habitats. Considering the nature of the hypothesized, year-round Mississippian occupation, it is difficult to say if its presence is due to cultivation, opportunistic harvesting, or inadvertent deposition. Maize (Zea Mays) is also present. The number and type of native and tropical domesticates and the degree to which they contributed to the Mississippian diet are still problematical.

Maize is not present at 38BK236, but the other seed species listed above are present, plus Liliaceae and Polygonaceae. If Polygonaceae represents knotweed (Polygonum erectum), there is a possibility that Middle-Late Woodland people may have been cultivating as well as harvesting goosefoot and knotweed (Asch, Farnsworth, and Asch 1979: 83).

The number or diversity of nut and fruit remains is about the same for both sites, though specific species differ. The Mississippian assemblage contains black walnut (Juglans nigra), hickory (Carya spp.), and acorn (Quercus spp.). Persimmon (Diospyros virginiana), dogwood (Cornus spp.), and grape (Vitis spp.) are present in both assemblages, and blackberry (Rubus spp.) is also present in the assemblage from 38BK236.

Further refinement of the percentage proportions using the concept of niche width is not attempted at this time as the research necessary to calculate the calories or biomass for such analysis falls outside the logistical capability of this scope of work. Corn accounts for 5% of the botanical remains at 38BK235. The earliest time for a Mississippian population to plant maize on the Coastal Plain is the first of April. Sumac is the earliest available wild species represented at 38BK235. It is available in the spring, but its use was confined to beverages and medicines, according to ethnohistorical accounts (Canouts 1971). Seventy-four percent of the remains at 38BK235 are fall nuts. This pattern may suggest that 38BK235 may have served as a centralized location for gathering and storing nuts in the riverine zone.

From these distributions, the range of riverine-specific wild resources appears to be similar between 38BK235 and 38BK236. Two factors may be contributing to this pattern. First, if corn agriculture is a significant aspect of the Mississippian subsistence base, then the niche width may indicate increased reliance and the resource diversity may also be smaller. Harvesting a wide range of resources may not have sustained a more sedentary population relative to the energy expended, and more time and effort might have been given to high-yield cultigens such as corn and high-yield nut species. Second, the seasonal exploitation of the riverine zone in the Middle-Late Woodland period may have been more intensive and opportunistic than expected.

The distribution of wood taxa between the two sites is also different (Table 47). Both sites contain fragments of pine, oak, hickory, willow/poplar, and sycamore. However, walnut, elm, maple, ash, persimmon, and juniper wood were found only at 38BK235, and magnolia and grape only at 38BK236. More hardwoods are represented at 38BK235, and many of these hardwood species have technological, in addition to subsistence, uses (see Canouts 1971; Swanton 1946).

The osteological data add little to the interpretations presented thus far. Lack of bone preservation is a major factor. No bone was recovered from 38BK236. Although 119,810 bone fragments were recovered from 38BK235, they were small, burned fragments. Less than one percent of the bone was identifiable: 929 human; 116 turtle; 28 dog; 19 deer; 10 turkey; 1 raccoon; and 1 viper. The semi-aquatic turtle species are the only representatives of an aquatic-specific environment. One mollusc fragment was also recovered, but Neusius believes it to be marine in origin. The absence of fish and waterfowl is puzzling, given the riverine setting, and may be caused by problems of preservation and recovery.

The remaining unidentifiable bone appears to be bird/mammal or small-to-large mammal. All but nine bone fragments were contained in pits where both human and animal bone were identified. The density of the mammal bones, their burned condition, and the pit matrix probably contributed to their greater preservation. If the majority of mammal bone is human, and that is a distinct possibility, the absence of other animal bone in other contexts is indeed puzzling. The occupation midden in Feature 7 contained no bone, although a viper vertebra was found in the hearth. Seven deer skull fragments (teeth and a sesmoid) were found outside Feature 7 in the northern portion of Block Excavation Area 1. The fact that the occupation midden contained no bone may be due to poor preservation (organic staining only), the lack of opportunistic burning, or midden deposition over the bluff edge of the swamp.

To summarize, the seed, fruits, and nuts do not exhibit greater resource variability in terms of diversity at the Mississippian site (38BK235) than at the Middle-Late Woodland site (38BK236). Significantly, fewer wood taxa appear to have been utilized at 38BK236, however. The ten animal species identified at 38BK235 is a fairly low number, although no osteological materials were recovered from 38BK236 for comparison. There is more variability between the two sites in terms of the proportional differences of potentially high yielding, wild, subsistence resources and cultigens. The presence of corn and the high percentage of late fall nuts at 38BK235 are noteworthy and may reflect reliance on high-yield resources for year-round occupation. The Middle-Late Woodland occupation appears to have been seasonal, spring/summer to early fall, and an intensive exploitation of a wide range of edible floral resources is indicated.

Site Settings and Activity Areas

Site 38BK235 is located at the edge of the Santee Swamp on the first terrace above the swamp. It may have been situated in an open, grassy setting, which would be expected under conditions of intensive habitation due to human intervention and disturbance of the successional stages through horticulture or other harvesting activities. The phytolith data from 38BK235 suggest an open, grassy environment. With the admonition that their occurrence may result from cultural activities, such as thatching huts, the dominance of grasses, forming festucoid phytoliths, coupled with sedges (Cyperaceae phytoliths) and a few diatoms, suggests an open setting near standing water (Data Supplement I).

Site 38BK236 is located on a small secondary drainage, the highest elevated area in the vicinity that is also near the swamp edge. It is situated logistically to take advantage of both upland and riverine resources. The small stream gradient in conjunction with the swamp edge would have provided a wide range of microenvironments conducive to the intensive harvest of summer seed plants and swamp dogwood. A near climax forest setting would be expected under conditions of short-term, seasonal habitation. With the same admonition that magnolia may occur in a cultural context, its presence at 38BK236 and not at 38BK235 is suggestive. The climax stage of the uplands on the Coastal Plain is characterized by *Magnolia grandiflora* and *Fagus grandiflora* or beech (Quarterman and Keever 1962: 170). Oak, pine, and hickory are dominant overstory species and *Vitis* is a rather regular occurrence in this generalized mesic, southern mixed hardwood forest; all of these species are represented at 38BK236.

The paleoecological data also bear on the possible functions of formally bounded space, specialized features, and discrete associations of archeological assemblages occurring at these two sites. Only one feature was identified at 38BK236, and the ethnobotanical materials recovered from it are not particularly definitive of spatially discrete subareas. However, the remains of 18 dogwood fruits were found in the vicinity of 1-KK. The distribution of dogwood and pine occurrences was mapped because they make up the majority of the recovered materials (Fig. 73). Both dogwood and pine occurred together in five areas; dogwood also occurred once each with chenopod, persimmon, and Liliaceae. These distributions many suggest subsistence-oriented associations for pine and dogwood.

The paleoecological data support the interpretation of Feature 7 as a domestic structure or a place where domestic activities occurred at 38BK235. Of the edible floral varieties recovered from this site, half occurred within this feature: hickory, walnut, acorn, persimmon, chenopod, corn, and grape. A corn kernel was found adjacent to the hearth, as were a dozen or more nuts of hickory, walnut, and acorn. These botanical remains were concentrated in the eastern half of the structure (Fig. 74).

Feature 7 has the highest festucoid phytolith density at 38BK235. This density could be accounted for by grass construction, a grassy, open surrounding, or both. Sedges and rushes were used for mats and house and bed coverings (Swanton 1946: 257; Cutler 1965: 102). The wood taxa fit the interpretation of a house or cabin. Besides being used for firewood, hickory, oak, and pine were used in house frames and house bark coverings

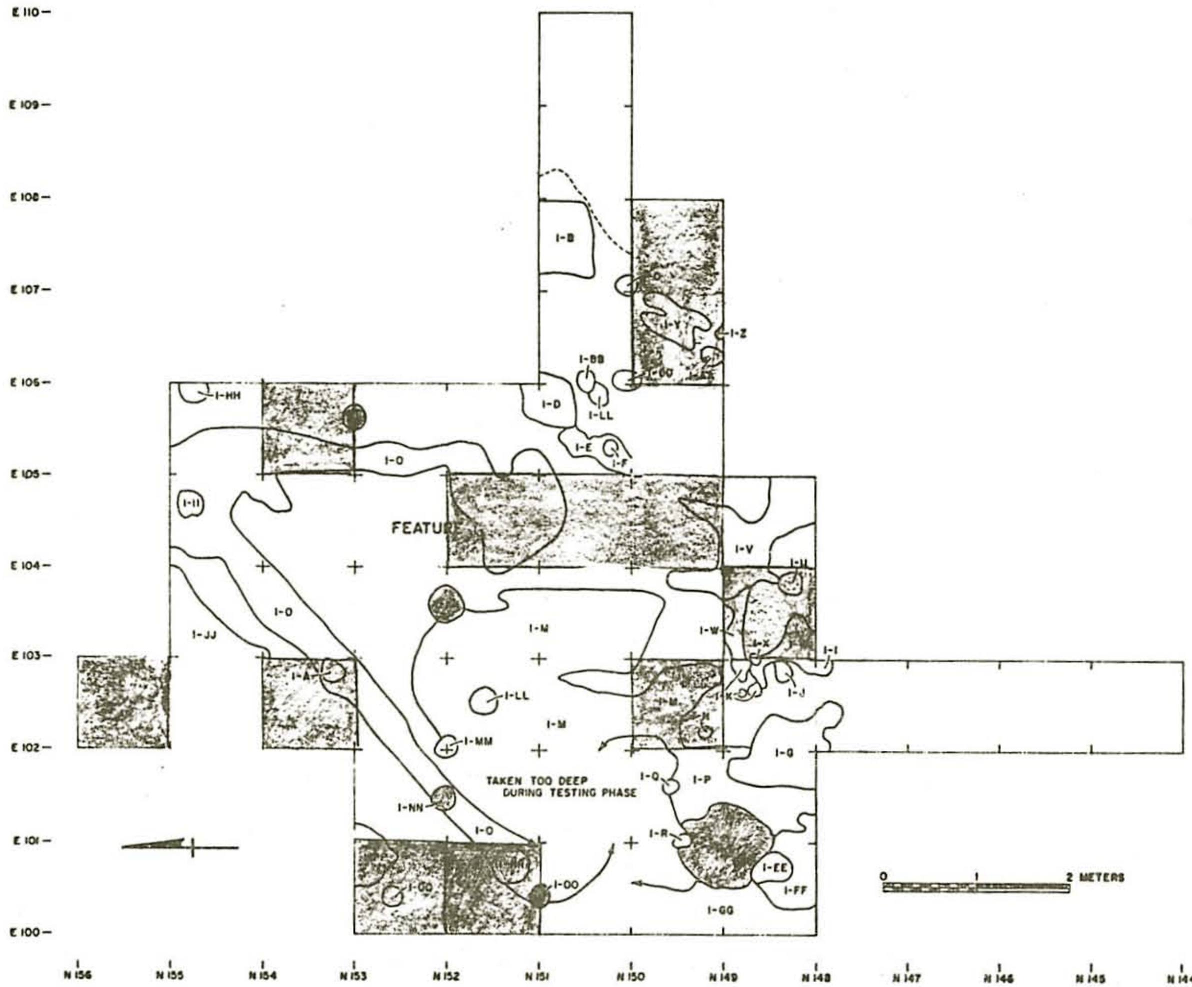


Figure 73. Distribution of dogwood and pine in Feature 1, 38BK236.

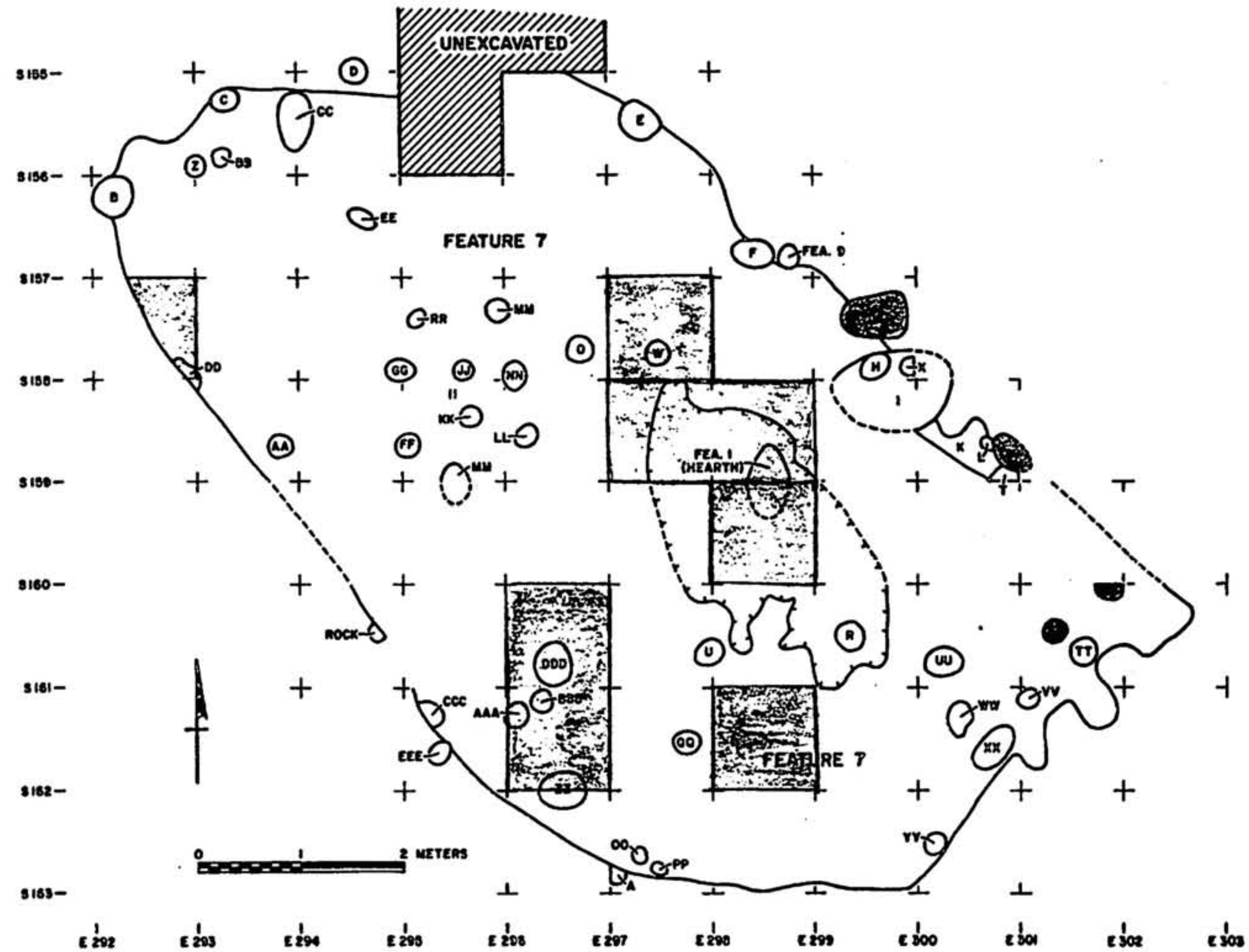


Figure 74. Distribution of nuts, seeds, and fruit remains in Feature 7, 38BK235.

(Swanton 1946: 245-246). Swanton lists other uses for the rarer representatives: maple--cordage; sycamore--spoons; ash--beds; willow/poplar--firesticks, stools, and doors; hickory--arrow shafts, bows, and pestles; and oak--mortars, beds, and dyes.

Feature 1, the possible hearth within Feature 7, contained a relatively high percentage of nongrass phytoliths, tending to confirm the hearth interpretation. It contained pine (73%) and small amounts of oak, hickory, and sycamore. Pine and oak are technologically referenced as choice tinder and firewood (Swanton 1946: 245). In contrast with the rest of Feature 7, the hearth lens and areas surrounding the hearth are high in phosphorous and calcium, indicative of vegetal and animal matter. Within the hearth itself the calcium count is lower, suggesting more heating--perhaps heating in pots--than direct cooking of meats. Both complicated stamped ceramics and burnished plainwares are heavily concentrated in the hearth area.

The single viper vertebra found in the hearth is interesting. Among the Atlantic coast Indians vipers were eaten and their fangs used for scarification (poison?) and also for arrow points, combs, and scratchers (Swanton 1946: 252, 281, 564). However, some Indian groups feared poisonous snakes. The Creeks apparently feared to kill snakes (Swanton 1928: 709). Bartram (Harper 1958: 218) observed this same veneration or dread when a rattlesnake was allowed to take over a Seminole village while the inhabitants fled.

The paleoecological data from the other structural features at 38BK235 (Features 14AA, 15, 16, and 17) are not very definitive. The posts of Features 15 and 17 may have been of pine, although the remains are scanty and one fragment of hardwood was found in Feature 17. There is little evidence of posts decaying in place at Feature 15; the fill appears to be redeposited midden (Data Supplement I). Feature 16 has a higher wood count and a relatively high representation of hardwood (30%). One unidentified nonwood carbonized fragment was recovered from this feature, as well. Feature 14AA exhibited a reversal of the high softwood-to-hardwood ratio found in the features at 38BK235. The only other such reversal at the site occurred in Feature 11/12 which is interpreted as a Middle-Late Woodland pit. The softwood of this feature was all pine; the hardwood, Carya spp. and other unidentifiable hardwoods.

Subfeature D' within Feature 14AA probably predates the structure, given the superposition of posts E and F. The contents of the subfeature suggest a storage pit. Only six medium-large mammal bones were identified, and high phosphorous together with low calcium may indicate vegetal storage. Three corn cupules were found in the grid which contained the lower quarter of D'. While festucoid grass types predominate, there is also some representation of nongrass types in this feature.

The remaining features at 38BK235 (Features 4, 5, 6, 10, and 14BB) are pits that were filled with small, burned bone fragments. They present an unusual juxtaposition of osteological, archeological, and ethnographical patterns which are difficult to interpret definitively. Features 4, 5, 6, and 10 were found north of Feature 1 in Block Excavation Area 1. Although Feature 4 was twice as large as the others, it and Feature 10 contained the least amount of bone. The bone was identified only as medium-large mammal. Feature 6 contained identifiable human bone representing one adult and one sub-adult. Hardwood fragments and pine were also recorded in Features 6 and 10.

Feature 5 contained the largest amount of bone recovered in this excavation block (1,345 fragments or 40%). It also had a high wood, nut, and seed content: walnut, hickory, acorn, persimmon, and maypop (see Chapter 3). A significant amount of the wood was hardwood (27%); Quercus spp. and red oak were identified. A minimum of two individuals are represented. Three of the bone fragments bore cuts, scratches, or grooves. In addition to the human remains, the pit contained possible turtle, bird/mammal, and indeterminate mammal.

Feature 14BB, about ten times as large as these pits, contained 85% (101,990 fragments) of the bone recovered from the site. Cranial elements are present in most subfeatures, and the total number of individuals represented is probably closer to fifty. The large number of foot and hand elements, along with the large number of cranial elements, may indicate the presence of entire skeletons in the subfeatures. Only a few animal species are represented in the feature: deer, turkey, turtle, raccoon, and dog. Most of these bones represent single individuals.

Feature 14BB does not appear to have remained open long enough for erosion to seal deposits within the pit. However, distinct bone groups were observed, and these units were excavated as subfeatures in the field (see Chapter 3). The identification of bone, its treatment, and artifacts associated in several of these subfeatures are presented in Table 1. Red, yellow, and blue-green stains, observed on some of the bone, suggest special treatment. Grooves, also observed on some bone, might be the result of defleshing.

The majority of the bone in all the features appears to have been burned while green and at such a high temperature that all the collagen was removed. Although burning was not evident on all the bone, the similar condition of the bone fragments, and their very preservation, argue that most of the bone must have been burned. A comparison of the possible differences between the condition of the animal and human bone is not possible with so much of the bone unidentified.

The bone in Feature 14BB was not burned in situ. There is not enough wood remaining in the pit. In fact, Subfeature X', which contained a large amount of nongrass phytoliths, was considered a possible ash dump (Data Supplement I). The discrete dumping episodes, described in Chapter 3, suggest that the bone and ash were contained. The festucoid phytoliths that dominate Feature 5 and Feature 14BB could result from the wrapping of burned bones in grass mats. Yet some spillage of the contents was noted in the excavation of Feature 14BB. Either not all bones were wrapped, or if grass mats were used, the mats may have been destroyed, i.e., burned before deposition occurred.

The human bone and associated matrix suggest secondary deposition of cremated remains in both the large and small pits (including Subfeature C' located in Feature 14AA). While there is little archeological evidence of individually cremated burials, at least one observer noted an intriguing practice in the seventeenth century among the Indians of coastal Virginia:

> They burn the Bodies of the dead; and sow up the ashes in Matts, which they place near the Cabins of their Relations (Glover 1676: 24-25).

Communal disposition of the remains better fits the scale of Feature 14BB. Of course, the use of true ossuaries (periodic depositions of skeletal material representing individuals initially stored elsewhere--Ubelaker 1974: 8) is well-known among the Iroquoian groups, as well as throughout the mid-Atlantic region in Maryland, Delaware, Virginia, and North Carolina (Ubelaker 1974: 8-11). In northern coastal North Carolina, Phelps (1980: 8) describes a posssible Algonkian ossuary containing "some charred and uncharred human bone," but the feature unfortunately already had been largely eroded by tidewaters when discovered in 1972. Phelps has excavated a number of ossuaries on the northern coast of North Carolina, dating to the Late-Woodland (A.D. 800-1650) Colington phase, but the eroded 1972 feature is the only occurrence of charred bone mentioned by Phelps (1980). It is not known whether this bone was burned when dry or green.

The practice of defleshing bone after the bodies had decayed and storing bones in charnel houses for later disposition was common among southeastern Indians (Swanton 1946: 718ff). However, the burning of green bone does not fit the pattern of saving the bone and burning and/or burying it when the charnel houses were full. Burning of the (dry) bones of the dead is known ethnographically for the coast of South Carolina.

> When the body hath Stood a Certain time ... they take it down and take off all the leaves and Canes, from about the bones, wch. they find to be very White and Cleane, then they put the bones into a Baskett and Carry them to a kind of Shed built for the purpose, and there Sett down the Baskett with the Stones, in it, next to the Relation before deceased & when the place is filled, so that they have no more romme, they bring a large Earthen pott, and make a fire about it, and Cast in the bones of their Relations, which, when burnt and the pott cold, they bind a Deer-Skinn over the top of the pott and bury it in the Ground (Warwick 1694, quoted in Waddell 1980: 68).

There is at least one other archeologically known instance of cremation remains on the coast of South Carolina. Stanley South (1971: 213) reports one large pit (Burial 255) at Charles Town (38CH1) which contained "four bundle burials and cremation remains. These bundles also contained long bones with burned ends...."

Within Feature 14BB, the large percentage of identifiable cranial, hand, and foot elements suggests that they may have been incompletely burned. The long bones, which might have been expected to be better preserved because of their density, were apparently positioned in such a way that they were heavily burned. There is at least one ethnohistorical account of the dead being laid out on a scaffold with a small fire underneath and conflicting accounts that the discarded flesh was either burned (perhaps with the supporting scaffold) or buried (Swanton 1946: 726, see Chapter 3). It may be that in certain cultural contexts the bone as well as the flesh was burned directly after death. Additional ethnohistorical research and archeological excavation may suggest other hypotheses to explain the phenomena at 38BK235. So far as is now known, this site is one of the few archeological occurrences of secondary deposition of burned human bones on the South Carolina Coastal Plain.

A comparison of the paleoecological data with other structural and functional data from these two sites located on the edge of the Santee River indicates a sharp distinction between the prominence of features at 38BK235 and the lack of prominent features at 38BK236. The paleoecological data better defined the activity areas identified at 38BK235, supporting the interpretation of some domestic functions associated with Feature 7 and dramatizing an extremely unusual method of the treatment of the dead. Apparently human (and possibly other animal) bones were burned in a hot fire while still green, then deposited in discrete areas near prehistoric structures. Some three to four dozen humans are apparently represented.

An analysis of the botanical remains suggests that a wide spectrum of wild foods was consumed by the inhabitants of both sites and that species found in both riverine and interriverine settings were sources of food. The botanical data do not clearly indicate more intensive use of the riverine zone in terms of a greater diversity or proportion of riverine specific resources in later times, i.e., at site 38BK235. Although corn was identified at site 38BK235, clearly wild foods played an important role in subsistence. It may well be that continuities in subsistence resources between Middle-Late Woodland and Mississippian are far greater than the differences.

CHAPTER 7

MODELING MIDDLE-LATE WOODLAND AND MISSISSIPPIAN SUBSISTENCE CHANGE

> Within the interior Lower Coastal Plain of South Carolina the Middle-Late Woodland settlement patterning represents a diffuse or generalized subsistence economy, involving exploitation of riverine and interriverine resources; whereas the Mississippian settlement patterning represents a focal subsistence strategy, involving primarily the intensive exploitation of a relatively narrow range of specific, high density, seasonal and year-round riverine resources (principally those obtained from the river swamp).

Analyzing the late prehistoric subsistence-settlement systems for the interior Lower Coastal Plain of South Carolina required the formulation of a new hypothesis. New data resulting from recent archeological surveys in the interior and interdisciplinary geological and archeological studies of sea level change, combined with new environmental and ethnohistorical reconstructions, no longer fit traditional models of coastal-oriented adaptation or a seasonal transhumance between the coast and the interior. The model of late prehistoric subsistence change developed to accommodate these new data (see Chapter 2) can now be evaluated against the test results from the analyses of paleoecological, assemblage, and feature data from sites 38BK235 and 38BK236.

I. Model of Middle-Late Woodland and Mississippian Subsistence Change in the South Carolina Interior Lower Coastal Plain

Based on existing settlement, environmental-ecological, and ethnohistoric data, it is inferred that the interriverine zone of the interior Lower Coastal Plain was utilized during prehistory primarily for the exploitation of acorns, hickory nuts, and deer in the fall and early winter. Because of a general trend in population growth and a general reduction in nut and deer productivity due, in part, to a rising Holocene sea level, these subsistence resources were exploited on a more labor-intensive basis during the Middle-Late Woodland than earlier. The dispersed Middle-Late Woodland settlement patterning observed in the interriverine zone represents the seasonal dispersal of human populations into small groups for purposes of intensively exploiting high densities of nuts and deer occurring on small, dispersed patches of well to moderately well-drained soils.

Further, the data tentatively indicate that Middle-Late Woodland populations inhabiting the interior Lower Coastal Plain were concentrated in riverine areas during the remainder of the year, presumably to take advantage of a broad range of high density, seasonally available resources (winter through summer) occurring in various riverine microenvironments.

From riverine sites we may also infer that Middle-Late Woodland populations were larger and more sedentary, at least on a seasonal basis, than earlier populations. A more labor-intensive economy might also be inferred.

The combined data for the Mississippian period suggest an increased emphasis on riverine subsistence resources. Higher population densities and year-round habitation, though not necessarily at one site, in riverine areas are also inferred. Based on Christenson's (1980) Midwest examples, we might expect a broad range of riverine subsistence resources to have been utilized during the Mississippian. In fact, in terms of total resource use, we might even expect more resources (increased resource diversity) to have been utilized during the Mississippian than the Middle-Late Woodland period. However, we would expect a reduction in niche width during the Mississippian, such that there would be a disproportionate use of resources, with an emphasis (focus) on one or only a few resources that could be most easily intensified from a least-cost perspective. Whether or not this intensification involved maize or other cultigens remains to be seen.

From the foregoing discussion, it is suggested that within the interior Lower Coastal Plain of South Carolina, the Middle-Late Woodland represents a diffuse or generalized subsistence economy, involving the exploitation of a broad range spectrum of riverine (winter through summer) and interriverine (fall) resources. In contrast, the Mississippian represents a focal or specialized subsistence economy, involving primarily the intensive exploitation of a relatively narrow range of specific, high density, seasonal and year-round riverine resources (principally those obtained from river swamps).

II. An Evaluation of the Model Based on Investigations at Sites 38BK235 and 38BK236

The level of generalization in this analysis relates to subsistence change between the Middle-Late Woodland and Mississippian periods in the interior Lower Coastal Plain of South Carolina. Formal testing of the major hypothesis generated by the model necessitated the development of a series of comparative, site-specific, corollary hypotheses. Arguments of relevance for these six, corollary hypotheses are presented elsewhere (Chapter 2).

Specific test implications were derived for sites 38BK235 and 38BK236 representing the two periods of interest. The results can neither confirm nor refute the model. The derivation of increasingly specific analytical levels and test propositions are not axiomatic. Furthermore, the natural and cultural site formation processes affecting site integrity, the analytical methods employed, and appropriate interpretation of the data all affect the test results and, thus, any evaluation of the model. However, the test results can lend support to the model, and where expectations are not met, the results may help up refine or develop new hypotheses.

The analytical advantages and disadvantages in the selection of these two sites have already been presented in Chapter 3. Briefly, the sites occur in the riverine zone; they exhibit a similar order of magnitude; and both have midden deposits or organic staining and features. Unfortunately, both are multicomponent sites. The temporal components are not clearly distinguishable in profile or plan view at either site. Because of insufficient data (Chapters 3 and 6), site features could not be dated radiometrically. However, the materials associated with the features at 38BK236 are predominantly Middle-Late Woodland and at 38BK235, Mississippian (Chapters 3, 4, and 5). Therefore, for purposes of comparison, the major component at 38BK235 has been assigned to the Mississippian period and the major component at 38BK236 to the Middle-Late Woodland period.

Characterization and comparison of assemblages which have accumulated over the years and which may be the result of different functional activities must be understood in the context of what such coarse-grained assemblages may reveal (Binford 1980, 1982). This comparison considers changing subsistence strategies between two major periods spanning several hundred years. The trends that are modeled are, of necessity, general. Investigations of specific sites, even though they may have been occupied and reoccupied over these periods, provide more detailed information about these trends. Yet the problems of distinguishing contemporary, associated, intrasite and intersite activity sets, in order to compare functionally meaningful differences through time, remain. Characterization of the artifactual and biological assemblages in this analysis involves the identification of specific resources in context and the functional measure of variables used to describe the data. Continued work along these lines is necessary in order to link these data in functionally meaningful assemblage subsets, for example, assemblages related to the procurement, processing, storage, and consumption of specific kinds of food resources.

As the major hypothesis concerns subsistence strategies, the preservation of botanical and osteological remains is critical for obtaining information relating directly to resource selection and resource variability. Even with these data the reconstruction of the subsistence base relating resource variability to exploitative strategies is difficult. In addition to problems of data preservation, of whether remains are the result of technological or food consumption, or of whether remains in cultural settings are the result of cultural or natural activities, the measure of resource variability or resource diversity is not methodologically rigorous. Resource variability must include both the number and types of different species and their proportional contribution to the diet (Christenson 1980; Hardesty 1975). This study presents information on number, types, and seasonality of species, and from these infers the intensity and duration of riverine resource exploitation represented at 38BK235 and 38BK236. This beginning will provide a basis for further research into resource productivity, availability, habitat preferences, procurement costs, etc., all of which will add meaning to the calculation and results of diversity measures now being used (see Jochim 1981).

The remaining hypotheses consider the indirect relationships of technology and settlement location to subsistence. The investigation of these relationships is the objective of human ecological studies which have not reached the stage where the nature of these relationships and the conditions under which they occur can be assumed. There is no simple one-to-one relationship between resource diversity and cultural diversity. Functional studies in technology using assemblage data have relied heavily on experimental and ethnographic data bases. Functional studies of entire archeological site assemblages are quite recent and are usually found in more topical treatments than in site monographs. One of the problems is that traditional chronological and descriptive typologies used to order the artifact and feature data in site reports are not always suitable for determining functional categories. For example, morphological properties which include patterns related to use/wear, as well as form, are necessary. Variety of forms and variety of uses are two measures of functional variability. However, they are not mutually exclusive. The measure or calculation of assemblage variability must recognize that different measures taken from the same artifact may be expressing the same use relationships and that the same measures taken from different parts of the artifact, such as tool edges, may be reflecting multiple uses. Furthermore, the temporal trajectories involving manufacture, use, and curation affect the measure of artifactual variability. Added to these problems is a major problem of relating data from fragments to whole artifact morphologies. Despite the problems, this analysis has begun the task of sorting assemblage data on the basis of possible functional criteria. The emerging patterns are suggestive and direct attention to improving categories and methods.

In general, three of the six corollary hypotheses guiding the research have been supported (CH_2, CH_5, and CH_6): The Mississippian occupation of the riverine zone was more intensive than the Middle-Late Woodland, having more and better defined activity areas with a greater range of diversity and functional specificity in the artifact assemblages. The remaining three (CH_1, CH_3, and CH_4) were not supported with the present level of analysis: The Mississippian assemblages did not show either better exploitative patterns or greater diversity in raw material or subsistence resource use. In these latter instances, insufficient data and lack of methodological rigor may be influencing the results. Additional site data, especially from the interriverine zones, better temporal control, and further experimental and functional studies will help augment, alter, and qualify the hypotheses.

A summary of the expected and observed results for each corollary hypothesis follows. More detailed accounts of the methods and interpretations of the results are found in the individual chapters for each data set. See especially their comparative summaries.

> CH_1 A given Middle-Late Woodland site (e.g., 38BK236) will exhibit less resource (subsistence) variability in terms of species diversity and frequency than a Mississippian site (e.g., 38BK235).

Year-round occupation, certainly multiseasonal habitation, hypothesized for Mississippian riverine sites should result in the presence of a greater number of riverine resources and a greater total number of resources, in general, compared to Middle-Late Woodland seasonal occupations. The total number or range of resources exploited by Middle-Late Woodland populations would be represented as the sum of the remains from several seasonal sites, as Middle-Late Woodland groups moved to take advantage of seasonal, high-yield natural resources found in different environmental zones. Therefore, no one Middle-Late Woodland site should exhibit the total variability of subsistence resources or variability or intensity of riverine resourse use matching that at a Mississippian site.

The hypothesis includes both floral and faunal subsistence resources, and Christenson's (1980: 49) midwestern data suggest that a higher diversity should be found in both floral and faunal Mississippian remains. The hypothesis is not supported on the basis of the botanical evidence from the two sites. Neither 38BK235, due to the absence of a well-defined refuse area, or 38BK236, due to the lack of bone preservation, provided evidence for zoological subsistence items.

The total number of identified seed, nut, and fruit remains from the two assemblages is equal: 12 at both 38BK235 and 38BK236 (Table 46). (The identification of plant remains at different levels of specificity, i.e., family, genus, and species, affects measures of variability. In this case, Juglandaceae was excluded from the count, as specific species from this family were identified in both assemblages.) Additional taxa not found in these two assemblages were identified in Middle and Late Woodland contexts from the adjacent Lake Mattassee sites (see Fig. 2): they are Pentederia cordata (pickerelweed); Myrica spp. (bayberry); Phytolacca americana (poke); Nyssa spp. (tupelo or black gum); Labiatae (mint); and Compositae (daisy) (Harris and Sheldon 1982: 347). Cyperaceae (sedge) was also found in Woodland context. Only Cyperaceae phytoliths were found in the Mississippian assemblage from 38BK235. These identifications bring the total number of Middle-Late Woodland floral species to 18 as compared to 13 (including sedge) Mississippian floral species. The number of identified species found at any one Middle-Late Woodland site was 15 at 38BK226, 12 at 38BK236, 6 at 38BK246, and 4 at 38BK229 (Harris and Sheldon 1982: 346-347, 349).

Riverine-associated species were also expected to be higher at the Mississippian site. The plant data are not conclusive. The Middle and Late Woodland components at the Lake Mattassee sites yielded several species associated with the swamp: sedge, pickerelweed, bayberry, and Nyssa spp. (Harris and Sheldon 1982: 350). According to Harris and Sheldon, the absence of some of the seed taxa associated with the swamp margin and the presence of pine and dogwood at 38BK236 are attributed to its drier topographic setting, which today is located 300 meters away from the swamp edge. The charcoal from 38BK236 also suggests a near climax forest setting.

The type of plants might also be expected to differ with more seed and nuts being exploited in the Middle-Late Woodland period, and more and different types of other plants and cultigens during the Mississippian (Christenson 1980: 50). Both 38BK235 and 38BK236 have about the same number of fruits and nuts if pine is counted in the subsistence diet of Middle-Late Woodland populations. If not a factor of preservation, and 38BK236 does show higher counts for some species, there is a smaller number of late fall (October) nuts appearing at 38BK236 than at 38BK235. The Lake Mattassee hickory nut and acorn remains show a decreasing frequency from Early Woodland to Late Woodland which may reflect the effects of sea level changes on these stands (Chapter 2; Harris and Sheldon 1982: 346). In this regard, the occurrence of pine nuts and dogwood fruits at 38BK236 is sug-

TABLE 46

SEED, NUT, AND FRUIT REMAINS

SPECIES	SEASON Sp	Su	F	38BK235 Frequency	Percentage	38BK236 Frequency	Percentage
Juglandaceae (hickory/walnut)			X	30	36.6	1	1.3
Juglans nigra (black walnut)			X	9	11.0	-	-
Carya spp. (hickory)			X	17	20.7	2	2.6
Quercus spp. (acorn)			X	5	6.1	0	0
Diospyros virginiana			X	2	2.4	1	1.3
Cornus spp. (dogwood)		X	X	5	6.1	49	62.8
Pinus spp. (pine)		X	X	0	0	12	15.4
Vitis spp. (grape)		X	X	3	3.7	3	3.9
Rhus spp. (sumac)	X	X		1	1.2	0	0
Chenopodium spp. (goosefoot)		X	X	1	1.2	1	1.3
Rubus spp. (blackberry)	X	X		0	0	1	1.3
Galium spp. (bedstraw)		X		1	1.2	3	3.9
Gramineae (grass grains)				2	2.4	1	1.3
Leguminosae (legume seeds)				2	2.4	1	1.3
Polygonaceae (herbs: e.g., knotweed)		X	X	0	0	2	2.6
Liliaceae (herbs: e.g., smilax, yucca)	X	X	X	0	0	1	1.3
Zea mays (corn)		X		4	4.9	0	0
TOTAL				82		78	

gestive. Pine nuts are absent and the number of dogwood seeds is substantially lower at 38BK235. Dogwood (*Cornus* spp.) has also been identified at the Lake Mattassee sites of 38BK226 and 38BK246. Certain species of pine and dogwood ripen in August. Their presence may indicate an extension of summer occupation in the riverine zone through early fall, when then Middle-Late Woodland peoples moved into upland, interriverine zones to harvest nuts and deer.

No doubt some of the seed species also served as greens or condiments (Swanton 1946; Canouts 1971). *Chenopodium* spp., *Galium* spp. Gramineae, Leguminosae, Polygonaceae, and Liliaceae are present in the Middle-Late Woodland assemblage at 38BK236. The additional seed taxa already referred to in the Lake Mattassee site increase the number of seed taxa in the Middle-Late Woodland assemblage to over twice the number in the Mississippian assemblage.

The role of domesticates in the assemblages is difficult to evaluate. The wild, starchy seeds of *Chenopodium* spp. and *Polygonum erectum* (polygonaceae) were widely harvested in the Middle Woodland period. They may also have been cultivated (Asch, Farnsworth, and Asch 1979: 83). The presence of *Chenopodium* and *Zea mays* in the Mississippian assemblage at 38BK235 may suggest continuing horticulture with the addition of maize. The more limited number of seed taxa in the Mississippian assemblage may also suggest increasing reliance on one or more cultivated species.

One kernel of corn was recovered from the habitation structure (Feature 7), and three maize cupules were recovered from a probable storage pit (Feature 14AA, Subfeature D') at 38BK235. Although no maize was recovered from 38BK236, several fragments were recovered from Feature 21 at site 38BK226 in the Lake Mattassee project. The feature was dated to the Late Woodland period on the basis of associated artifacts, but Harris and Sheldon (1982: 346) do not consider it an important subsistence item and even suggest the possibility of later deposition. The corn from 38BK235 is a non-dent variety (Chapter 6; Data Supplement I), and the corn from 38BK226 is considered similar to the Northern Flint/Eastern Complex (Harris and Sheldon 1982: 346).

The midwestern floral data show maize contributing the major portion of the diet (.45) with nuts a distant second (.14), during the Mississippian period (Christenson 1980: 51). The presence of corn at 38BK235 and the greater number of fall nuts suggest that Mississippian populations were investing in the selection of high-yield resources. The distribution of nut-bearing trees during the Mississippian (Chapter 2) may have allowed gathering and storage from a centralized riverine location.

Mississippian year-round or more substantial, multiseasonal occupation of the riverine zone receives some support from the higher diversity of wood charcoal (Table 47), some of which could have supplied technological items. The grass and sedge phytoliths also identified at 38BK235, suggest a more open, grassy setting which might have been the result of Mississippian planting and harvesting activities.

The few animal remains recovered from 38BK235 offer little comparative information. In addition to human bone, 116 turtle, 28 dog, 19 deer, 10

TABLE 47

DISTRIBUTION OF WOOD TAXA

SPECIES		38BK235	38BK236
Pinus spp. (pine)		X	X
Juniperus (juniper)		X	0
Quercus spp. (oak)		X	X
Carya spp. (hickory)		X	X
Juglans spp. (walnut)		X	0
Ulmus spp. (elm)		X	0
Magnoliaceae (magnolia)		0	X
Salicaceae (willow/poplar)		X	X
Platanus occidentalis (sycamore)		X	X
Acer spp. (maple)		X	0
Fraxinus spp. (ash)		X	0
Diospyros virginiana (persimmon)		X	0
Vitis (grape)		0	X
	Taxa	11	7
	n =	1625	1216
	Softwoods	66%	80%
	Hardwoods	34%	20%

turkey, 1 raccoon, and 1 viper bone were identified. Most of the bone was in a context which suggested specialized treatment, related to ritualized (even a possibility of cannibalistic) body processing (see Chapters 3 and 6).

In summary, if the Mississippian populations are investing their labor in the harvesting of corn and nuts, opportunistic gathering of additional genera may not be fully represented, especially as only one Mississippian assemblage is analyzed. An extensive Middle-Late Woodland exploitation pattern focused on the riverine zone is suggested by the large number of plant species represented at a number of riverine sites. If the Middle-Late Woodland exploitation of seed taxa is at all intense or some species are cultivated, the greater amount of harvest may account for their representation, despite greater preservation problems. The differences between the Middle-Late Woodland and Mississippian in the midwestern data, though not large, are based on a much larger sample (Christenson 1980). More information is required from Mississippian site assemblages before the Middle-Late Woodland period may be said to exhibit a greater diversity of exploited species than the Mississippian period in the interior Lower Coastal Plain of South Carolina.

> CH_2 Middle-Late Woodland artifact assemblages will exhibit lower overall diversity in forms (i.e., fewer types, with multiple uses for each type), while the Mississippian assemblages will exhibit higher overall diversity (i.e., increased functional specificity). While the use-functional variability per artifact is expected to be higher in the Middle-Late Woodland period than in the Mississippian, the actual number of artifact types within a Middle-Late Woodland assemblage is expected to be lower, and hence exhibit a lower diversity index than the Mississippian.

Data sets applicable to the testing of this hypothesis include bifaces, flake tools, and pottery. An analysis of the Mississippian stone tool kits was expected to show more distinctive, specialized single-function tools as reflected in the types of observable use/wear modification. Middle-Late Woodland stone tools kits were expected to exhibit relatively fewer tool types with multiple uses per tool, i.e., more use/wear types per tool. The Middle-Late Woodland pottery was expected to exhibit less variability in morphology, composition, and surface treatment than the Mississippian pottery.

Identifying functional variability and assigning the measurable variability to the appropriate temporal assemblage proved to be the most difficult methodological problem faced in this analysis. The lithic and ceramic data sets served complementary ends. Because the ceramics were more temporally sensitive, these data tended to lend more support to the functional arguments presented in the hypothesis than did the lithic data, which were more functionally sensitive.

Although the pottery assemblage relates more directly to domestic activities, the differences in vessel size and shape suggest that functionally discrete activities were occurring at the Mississippian site on a different scale than those occurring at the Middle-Late Woodland site (Table 48). The Middle-Late Woodland ceramic assemblage has half as many vessels as the Mississippian, 10 and 22 respectively, and exhibits fewer types, based on rim form, 4 and 6 respectively. There is also an indication of possible temper differentiation, based on quartz grain size, in the Mississippian assemblage. This difference was also noted in the analysis of the Mattassee Lake pottery assemblage (Anderson 1982: 225).

Specific functions could not be assigned to vessels or vessel types; however, the range of vessel rim to horizontal curvature ratios suggests that storage, cooking, and serving vessels may occur in both assemblages (Table 48). The range of these ratios is broader for the Mississippian than for the Middle-Late Woodland, and this range may mean greater functional specificity.

The composite Middle-Late Woodland vessel has a more restricted orifice (rim) than the similar composite of a Mississippian vessel. The morphological characterization of the Middle-Late Woodland assemblage suggests generalized or multifunctional use rather than restricted access, however (Chapter 4, Fig. 32). A generalized or multifunctional form is also supported by temper size. The majority of the Middle-Late Woodland pots were very coarsely sand tempered. Larger temper is hypothesized to withstand repeated thermal stress. The pots may have been used interchangeably for processing, cooking, and serving.

The size of the orifice assumes significance in comparison to the volumes of the composite vessels. The volume of the Mississippian composite vessel is half again larger than the Middle-Late Woodland vessel (Table 48), and the composite shape suggests that the Mississippian assemblage may be characterized by unrestricted access to vessel contents. The larger vessel size would hold more portions, whether for processing, cooking, or serving, or for storage. Larger vessels are expected to relate directly to group size or indirectly to extended occupation of a site location if vessels are used for storage. Even if the larger vessels have a specialized, nondomestic function, their use would seem to reflect, however indirectly, more differentiated social or economic support systems.

TABLE 48

COMPARISON OF THE FUNCTIONAL DIVERSITY
IN THE CERAMIC ASSEMBLAGES

Variable	Middle-Late Woodland	Mississippian
Number of Vessels	10	22
Vessel Diversity (based on rim form)	.55	.70
Range of Rim Diameters	15-60 cm	10-95 cm
Range of Rim to Horizontal Curvature Area Ratios	1: .1 to 1:2.5	1: .2 to 1:5.0
Composite Vessel Volume	11 liters	15 liters
Number of Morphologically Distinct Wares	?	2
Multifunctional Vessel	+	-

Both assemblages exhibit differences between plainwares and stamped pottery relative to thickness. However, the difference is expressed most clearly in the Mississippian assemblage, in which the complicated stamped vessels have almost three times the capacity of the burnished plainware vessels: 27 to 11 liters. This morphological division suggests two functionally distinct Mississippian wares (Table 48).

The surface treatment of the Mississippian sherds appears nearly as variable, if not more variable in terms of rim treatments (e.g., a combination of incising and punctation), than the Middle-Late Woodland sherds, even though the selection of the Mississippian sherds was based on eliminating body surface treatment associated with earlier ware groups.

Mapping the distribution of the body surface treatments revealed no distinct patterns within the sites or site features. Surface variation was analyzed primarily from a technological perspective, a paddled versus a smoothed finishing technique. As noted, there is a tendency for thickness to vary relative to surface treatment, perhaps in association with technological production of sizable vessels or their intended use. Exceptions to this tendency are furnished by Anderson (1982: 228-229), who believes that finer temporal control would result in finer-grained functional interpretations relative to surface treatment. Some technological distinctions for the Early Woodland period are noted in his chronological study of the Mattassee Lake pottery, (e.g., trend from incurvate to excurvate vessel profiles [Anderson 1982: 234]), but neither of these studies provides the finer-grained petrographic analysis or surface attribute analysis capable of eliciting interpretation about functional use or manufacture in the context of specific subsistence activities or specific sociocultural groups (see Anderson, Cantley and Novick 1982: 371-372; Chapter 4).

The lithic functional analysis emphasized the biface and flake tool assemblages. Tool edges, falling within definitive parameters established for four use/wear variables (use-edge morphology, use-edge angle, type of wear, and wear location) were categorized into eight functional types: cutting, scraping, piercing/perforating, and chopping, these being subdivided on the basis of hard/dense or soft materials processed (Tables 24 and 26). A total of 139 biface and 43 flake tool edges, about 37% of the use-edges analyzed, met all four criteria and were assigned to their appropriate functional categories (Table 49).

After the chopping and cutting categories were collapsed for the bifaces, all but one edge of a Yadkin biface, used for piercing/perforating, were classified as cutting tools used on hard/dense (46%) and soft (54%) materials. All of the functionally identified flake tool edges are from 38BK235. One utilized flake exhibited a cutting edge used on hard/dense materials; the remainder were used to scrape both hard/dense (45%) and soft (55%) materials.

The distinction between processing hard/dense and soft materials tends to relate to the type of raw material. The local orthoquartzite is used more for cutting soft materials whereas the nonlocal siliceous materials are used for hard/dense materials. The fragile edges of siliceous, nonlocal materials are more susceptible to edge damage even in processing

TABLE 49

	Tools with use/wear	Total number of use edges	Number of edges Identified by Functional Category in Table 26	Multi-funtional Tools
BIFACES				
38BK235	180	290	132	47
38BK236	9	38	7	1
Sub-Total	189	328	139	48
FLAKES				
38BK235	126	168	43	12
38BK236	1	1	0	0
Sub-Total	127	169	43	12
TOTAL	316	497	182	60

relatively soft materials. Furthermore, siliceous materials may have been curated longer, experiencing heavier use and, thus, greater edge damage.

A comparison of the lithic data between sites is constrained by lack of temporal control at 38BK235 and 38BK236 and the small sample size at site 38BK236. Therefore, the analysis emphasizes the comparison of biface and flake assemblages between Features 7 and 14AA-BB at site 38BK235. Feature 7 exhibits greater variability in terms of tool forms than Feature 14AA-BB. Bifaces manufactured from local materials were used to cut hard/dense and soft materials. The flake tools, including spokeshaves, gravers, perforators, and burins, manufactured from local and nonlocal materials, were used to cut and scrape soft and hard/dense materials. This broad range of use appears to correspond to a wide range of activities that might be expected to occur in and around a domestic structure. The exhausted and broken bifaces from Feature 14AA-BB (large stemmed and notched forms) exhibited heavy edge damage (hard/dense cutting, perhaps from cutting against bone during flesh removal). Utilized flakes that processed hard/dense and soft materials were also present. These tools correspond to specialized activities hypothesized for this feature.

Of the biface edges, 48 were identified according to named typologies, another 22 by traditional morphological characteristics (Chapter 5: Tables 25-27). In many cases, however, the traditional chronological types did not fit the cultural chronological context, for example, "Archaic-looking bifaces" appear to be in context in Mississippian Feature 14BB at 38BK235 (Chapter 3). Reuse of earlier forms in later context is a possibility (see Novick 1982: 156; Tippitt and Marquardt 1981). Then, too, the range of morphological variability and time spans are unknown for Coastal Plain variants of several regionally identified forms (Novick 1982: 150; Appendix C).

The Mattassee Lake lithic analysis was focused on this variability using a monothetic subdivisive clustering program to help develop chronological, perhaps functional, groups of 121 projectile points (Novick 1982: 150-151). The resulting clusters were combined, based on morphological homogeneity (53 variables) and traditional typologies, into 20 groups. The points were not seriated on the basis of excavated strata as were the ceramics (Anderson 1982).

Projectile points from the Mattassee Lake sites were identified from the Middle Archaic through the Mississippian or protohistoric (Caraway triangular points) periods (Novick 1982: 151-165). The named types for 38BK235 and 38BK236 number more than the Mattassee Lake groupings. For example, there are more unnamed types for Mississippian points from site 38BK235, four, as compared to two groups identified as Mississippian for the Mattassee Lake sites. In both analyses, Archaic types predominate.

Bifaces generally attributable to the Woodland and Mississippian periods from sites 38BK235 and 38BK236 tend to be manufactured from the local orthoquartzite. The few Woodland bifaces categorized as to use-edge tend to show comparable processing of hard/dense and soft materials. However, the Mississippian bifaces show a greater use in processing soft materials, The pattern may indicate more expedient use of single-function tools unless orthoquartzite, due to its coarse-grained matrix, is less susceptible to edge damage. Multifunctional use of temporally assigned hafted bifaces is limited (two each for Woodland and Mississippian periods). The single-function use of the tools may be due to (1) the use of both edges of hafted bifaces for the same purpose; (2) the small sample size resulting from the use of four criteria; (3) the inability of the raw materials to show finer distinctions or the need for finer levels of observation; or (4) more single-function tool use than anticipated.

CH_3 The artifact assemblages of the Middle-Late Woodland populations will exhibit less utilization of nonlocal raw materials than will the Mississippian assemblage.

CH_4 The Middle-Late Woodland assemblage will demonstrate less selectivity within the range of available local raw materials than will the Mississippian assemblage.

Artifacts in both assemblages were expected to be manufactured from the local raw materials. However, due to the intensive use of the riverine resource base during the Mississippian period, there should be increased use of materials better suited to performing specialized functions. Comparatively, the Mississippian assemblage should show a higher frequency of better quality, nonlocal raw materials, a higher incidence of their curation due to specialization and better manipulation of local materials in terms of selection and technological enhancement.

At the present level of analysis neither hypothesis is supported by the evidence presented. All of the pottery appears to have been manufactured from local clays (Table 15), and approximately 90% of the lithic biface and flake tools is made of local stone (Table 25). The macroscopic paste analysis and the lithic raw materials analysis of the Mattassee Lake site assemblages support the trends noted here (Anderson 1982: 225; Anderson, Cantley, and Novick 1982: 369).

Specific compositional differences between the Middle-Late Woodland and Mississippian ceramic assemblages could not be detected at the present level of microscopic analysis. A slight difference occurred in the macroscopic observation of temper size, however. A high diversity index (0.77, Table 21) between the two assemblages was the result of a higher percentage of very coarse-grained sand temper in the Middle-Late Woodland pottery. Since it is hypothesized that most natural clay deposits would not have such a skewed representation, cultural selection may be at work, either in terms of specific procurement strategies or specific processing strategies that would affect the percentage of very coarse-grained inclusions.

The selection for coarser inclusions in paste may relate to technological benefits. Very coarse-grained tempered pottery can withstand greater thermal shocks. While both assemblages contain this type of pottery, the more even representation of temper size in the Mississippian assemblage may argue for more functional specificity for vessels. Only pots used in cooking need very coarse grains in the paste. Pots not subjected to repeated heating are stronger if manufactured with finer grained temper. As has been suggested, the very coarse-grained tempered pottery might be more multifunctional, receiving more emphasis in a Middle-Late Woodland setting.

The distribution of local and nonlocal raw materials in the lithic assemblage shows possible temporal and formal differences (Table 25). There is a difference through time in the use of raw materials for hafted bifaces based on traditional typologies. Significantly less use of nonlocal raw materials is made during the Mississippian period. The higher incidence of tools from nonlocal materials in the earlier Archaic periods probably relates to mobility and a higher degree of curation (Goodyear 1979). The heavy use damage exhibited by these artifacts argues for their use and reuse until they were exhausted or lost.

The difference in raw material between the biface and flake tools is harder to detect. Comparing these two tool classes shows no significant differences (Table 25). No differences were expected in the utilized flakes (89% local materials) because they were thought to be expedient forms. However, the formal flake tools (n = 13) exhibit a much higher percentage of nonlocal materials (n = 6), especially for the rarer types (Table 25). Whether this difference is temporally or culturally significant is unclear.

The formal flake tools appear to be associated with Mississippian features (Chapter 5). If this temporal association obtains, then this pattern supports a more functionally expedient use of hafted bifaces with functional specialization reflected more in the flake tools where there is also specific selection for nonlocal materials (CH_2).

If, however, the flake tools are earlier Archaic tools, the use of nonlocal materials would coincide with use of nonlocal materials for the earlier period hafted bifaces. The bigger question is whether all of the larger hafted bifaces that look Archaic but that were found in Mississippian features result from earlier use and discard, or possibly reuse or even manufacture at site 38BK235.

Distinguishing between multifunctional technological specialization and subsistence specialization based on intensive riverine zone exploitation strategies is difficult. Reasons for acquiring nonlocal raw materials may be related to technology as well as to subsistence. The manufacture of tools to perform multiple functions requires careful selection of raw materials, even to the selection of clays or preparation of clays with coarser temper for multifunctional vessels.

A finer analysis of the raw materials is necessary. The definition of local and nonlocal materials is crucial when considering the territory incorporated into proposed Middle-Late Woodland mobility patterns. Distributional studies of raw materials in private collections and further investigations of lithic sources are helping to address this question in South Carolina (e.g., Charles 1981).

A finer analysis of technological properties and methods of manufacture for pottery and stone tools may reveal subtler differences between the two periods, especially if there are specialized subsistence activities occurring in the Mississippian period. On the other hand, subsistence during the Mississippian period may simply involve activities that were served as easily, even expediently, with implements manufactured from local materials, having a wide range of technological responses.

CH_5 There will be fewer and less functionally distinct activity loci in Middle-Late Woodland sites than Mississippian sites.

The more limited nature of the Middle-Late Woodland habitation at 38BK236 was expected to result in more random distributions of artifacts and less well-defined activity areas. Site 38BK235 was expected to have a definitive Mississippian component, which would reflect functionally specific areas. Paleoecological, artifactual, and feature data sets were used to identify formally bounded space, specialized features, and discrete associations of archeological assemblages.

The data support this hypothesis. Although a functional interpretation of any activity area is still an art form in most archeological reconstructions, the Mississippian component at 38BK235 appears to consist of a house with an inside hearth, several cremation burials, and a few ephemeral structures. The Middle-Late Woodland site, which was not graded during excavation, showed faint traces of an occupation surface, but no hearths or other features were encountered.

The Mississippian features, even in this multicomponent site, appear to be physically well defined in terms of bounding specific activity areas and patterning in the artifactual and paleoecological data. This is especially true in and around the habitation area, Feature 7. If Feature 1 at 38BK236 is somewhat comparable in terms of a seasonal base camp, the subfeatures and archeological assemblages there are much more randomly distributed, even considering the problem of preservation.

The nature of the activities associated with the house and burials at 38BK235 is still unclear. The remains of edible plants found in and around the hearth area in the house and the occurrence of wood taxa for building materials (Chapter 6); the wide range of lithic tools and debris (Chapter 5); the pipe fragments (Chapter 3); and Mississippian burnished plain and complicated stamped vessels (Chapter 4) suggest domestic activities, but whether performed by a household of perhaps 5 people (Chapter 3) or a more socially specialized unit is difficult to say. Dispersed households or homesteads are recorded along the coast and interior of South Carolina (Chapter 2). Isolated structures may, however, serve specialized functions, as for the Husquenaugh youth ceremony (Chapter 3) or for functions associated with preparation and interment of the dead. The size of the burial population would argue for a larger settlement than represented by this single structure.

The burials are noteworthy in terms of their interment. There are two distinct burial areas corresponding to two distinct pit sizes, although the manner of interment appears similar. Four smaller pits, the largest no more than 1 meter in diameter, were located adjacent to the north side of the house. At least one of these pits contained the remains of two individuals, an adult and sub-adult. The largest feature (Feature 14BB, 5 meters in diameter) was located 50 meters to the southeast. It may have contained close to 50 individuals (Chapter 6).

All of the bone appears to have been burned while green, a pattern never before reported for the Southeast, although cremations and ossuaries are reported from the Atlantic coast (Chapter 6; Phelps 1980). Within Feature 14BB, the excavators delimited concentrations of bone, perhaps the result of individual depositional episodes. This feature also contained the most evidence of ocher stains and grooves on the bone, as well as a variety of animal bone, which, although representative of edible species, also occurs in personal adornments and symbolic contexts (Chapters 3 and 6). Artifacts are mixed, but whether intentionally or inadvertently is unclear. The large bifaces and utilized flakes could have been used to process the bodies (Chapter 5).

The cremated bone appears to be secondarily deposited with the bodies having been processed (that is, burned, possibly defleshed or disarticulated) in another area. Whether the number of bodies in the larger pit is the result of a catastrophic event associated with disease, weather, or even warfare with ritualistic consumption of the bodies, the stratification in the pit does not indicate a long period of use or reuse (Chapter 3).

There are four elliptical structures on the site, one of which lies adjacent to Feature 14BB. Perhaps they were used as scaffolds to lay out the dead (Swanton 1946). Temporary ephemeral structures, however, are also associated with houses. Ramadas, covered overhead with the sides left open to allow air circulation, were used for sleeping and eating in the summer

(Harris 1952: 187). Lawson also observed and described special purpose cabins used to store grain, skins, and other commodities.

These features are the first reported occurrences in the interior Lower Coastal Plain of South Carolina. How rare they are can be determined only by further excavations of structures and features definitely associated with domestic or ritual activities.

CH_6 Middle-Late Woodland sites will exhibit less intensive habitation than Mississippian sites.

Measures of intensive habitation involve a number of cross-cutting spatial, environmental, and artifactual dimensions. Comparatively defined, relative to population size and factors of preservation, an intensive habitation at 38BK235 should exhibit (1) a greater number and range of material goods; (2) more well-defined use of space; (3) a wider range of supportive activities; (4) more living space; (5) multiseasonal occupation; and (6) a more advantageous location relative to longer-term subsistence needs.

This hypothesis is in the nature of a summary statement of the evidence and interpretation for the other five corollary hypotheses (Table 50). The Mississippian ceramic assemblage has a larger number of identifiable vessels and vessels of greater size which may indicate less mobility. There are more Mississippian datable bifaces than Middle-Late Woodland, and more flake tools appear to be associated with Mississippian features at 38BK235 than were recovered from all of site 38BK236. At least four distinct types of features (2 types of structures; a hearth; and several bone pits) occur at 38BK235, assigned to the Mississippian occupation. In contrast, one feature (structure ?) was identified at site 38BK236, and if it is a habitation area, it is smaller than the habitation area at 38BK235.

Two distinct types of functions are represented at 38BK235; domestic (subsistence/maintenance) and socioreligious (burial). The latter may indicate warfare, as well. The occurrence of burials also fits the pattern of Mississippian populations concentrated in a few riverine settlements, which increases the likelihood of finding human remains. Several burial events (with the exception of Feature 14BB) may also indicate a sustained occupation.

The botanical evidence suggests that Middle-Late Woodland populations could have arrived in early spring to pick berries. The earliest time for the Mississippian population to plant maize on the Coastal Plain would have been the first of April. The botanical assemblage in Feature 7 suggests that the Mississippian population also subsisted on late fall nuts at the site.

Site 38BK235, located on the edge of the Santee Swamp, appears reminiscent of the plantation settlement in open forests, described by early chroniclers (Chapter 2). Site 38BK236, located on a small secondary drainage, is situated logistically where it would be possible to take advantage of several micro-environments located along the drainage and on

TABLE 50

COMPARISON OF HABITATION FEATURES
BETWEEN SITES 38BK235 AND 38BK236

Variables	Middle-Late Woodland (38BK236)	Mississippian (38BK235)
Material Goods		
Pottery:		
Number of Vessels	10	22
Composite Vessel Size	ca. 11 liters	ca. 15 liters (burnished plainwares = 11) (complicated stamped = 27)
Tool Kits		
Number of Bifaces	28 (Woodland = 2)	620 (Mississippian = 90)
Number of Flake Tools	1	126
Types of Features	1	4
Living Area	ca. 30 m^2	ca. 50 m^2
Range of Activities	1	2
Season of Occupation	Spring/Summer to Early Fall	Spring/Summer through Late Fall
Location		
Elevation	18 - 21 m	7 - 13 m
Distance from Swamp Resources	300 m	0 m
Occupation Area	10,800 m^2	32,040 m^2

the swamp edges. A near climax forest setting would be expected under conditions of short-term seasonal habitation.

Conclusion

Three of the corollary hypotheses appear to have been supported, yet the major hypothesis relating to subsistence has proven inconclusive. The Mississippian occupation does appear to be more intensive than the Middle-Late Woodland in terms of duration, variety of activities, and assemblage variability. Furthermore, the Mississippian house structure and human cremations, the first features of their kind to have been excavated and analyzed in the interior Lower Coastal Plain of South Carolina, point to a ritual investment at this particular locus. However, the Mississippian occupation does not appear to have been the result of a focused exploitation of river swamp resources. Several problems relating to preservation, the distinction between functional variability in subsistence-related contexts or technological contexts, and the need for finer observational distinctions in the paleoecological and artifactual assemblages have affected the results.

In general, while Middle-Late Woodland and Mississippian groups may have exploited the riverine zone floral resources intensively, they did not place the same degree of emphasis on the various available resources. Summer reliance on a variety of seed plants in the riverine zone and winter upland harvest of deer and nuts during the Middle-Late Woodland period appear to have been replaced by a dependence on high-yield domesticates, such as maize growing in riverine settings, and high-yield nut-bearing trees, the distributions of which may have been favorably affected by sea level changes.

The environmental and sociohistorical reasons behind this subsistence-settlement change in the interior Lower Coastal Plain are not yet understood. The formulation of this model is a beginning attempt to describe and analyze the differences, observed initially in site locations, in a framework of economics and human ecology.

A number of kinds of data have been analyzed, at several levels of abstraction. The excavation of additional sites in the interior Lower Coastal Plain, along with careful attention to the measurement of environmental and functional diversity, will no doubt shed light on these questions. It goes without saying that such basic problems cannot be solved by reference only to analysis at the level of pottery and projectile point typology, although the refinement of chronologies is an important step. Such studies must be augmented by the recovery and analysis of fine-grained paleoecological and techno-functional information. Our work constitutes a beginning in this research direction.

Support of the hypotheses as they now stand has already refined the traditional models of late prehistoric occupation and exploitation in the interior Lower Coastal Plain. For example, based on early ethnohistorical observations, inadequate environmental data, and minimal archeological survey, archeologists had adopted a model of coastal to interior transhumance for the fall and winter months. This study provides incontrovertible evidence that the interior riverine zone was also occupied and exploited in the summer and early fall by Middle-Late Woodland and Mississippian populations. The role that coastal resources may have played in late prehistoric subsistence strategies for both periods cannot yet be assessed in the absence of a wider regional data base. Again, such larger-scale questions must be addressed not only at gross typological levels alone, but with the benefit of detailed environmental and techno-functional analyses. Only in this way can useful distinctions be established among temporal, functional, and stylistic variability. We hope that our work has made an initial contribution.

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APPENDIX A

SITE SUMMARIES FOR 38BK239 AND 38BK423

Mark J. Brooks

INTRODUCTION

The following site descriptions summarize the intensive testing operations conducted on sites 38BK239 and 38BK423 by the Institute of Archeology and Anthropology, University of South Carolina, in 1979. No further mitigative investigations were undertaken before construction of the canal was completed. Additional data pertaining to these two sites may be found in the Data Supplements, and all material and field and laboratory records are curated at the Institute.

38BK239

This Middle-Late Woodland, Cape Fear phase site covers an oval area approximately 60 x 80 meters on top of and along the gentle slope of a small knoll located in the upland zone (Fig. A-1). The site overlooks a small intermittent stream to the west and northwest. A low swampy area is located at the base of the knoll to the south and east. The site rises from 18.5 meters at the stream edge to 21.5 meters at the top of the knoll. Based on the reconnaissance survey (Brockington 1980) and intensive testing, the most intensive occupation occurred in the eastern portion of the site on the relatively flat to gently sloping area just below the top of the knoll (Fig. A-1).

While data obtained from the reconnaissance survey (Brockington 1980) indicated that 38BK239 had a "modest" density of artifactual material, the density was not sufficient for hand-test excavations to be cost-effective. That is, in order to obtain artifact and feature data relevant to intrasite patterning, the subsurface examination of larger areas was judged to be necessary. Once large areas were exposed, and a preliminary understanding of intrasite patterning obtained, test excavation units could be strategically placed in a more cost-effective manner. This field strategy resulted in four bulldozer cuts (A-D) and a 2 x 2 meter test excavation unit (Fig. A-1).

The testing phase commenced with the preparation of a site contour map. A transit station at the south end of Cut A was used for all site mapping and for maintaining vertical control during the investigation. Upon completion of the contour map, the four bulldozer cuts were made, straddling the east-west ridge of the site. The cuts were about 3 meters wide and varied from 30-45 meters in length. Each cut was to a depth of 10-15 centimeters, just deep enough to remove the humus zone (Fig. A-2).

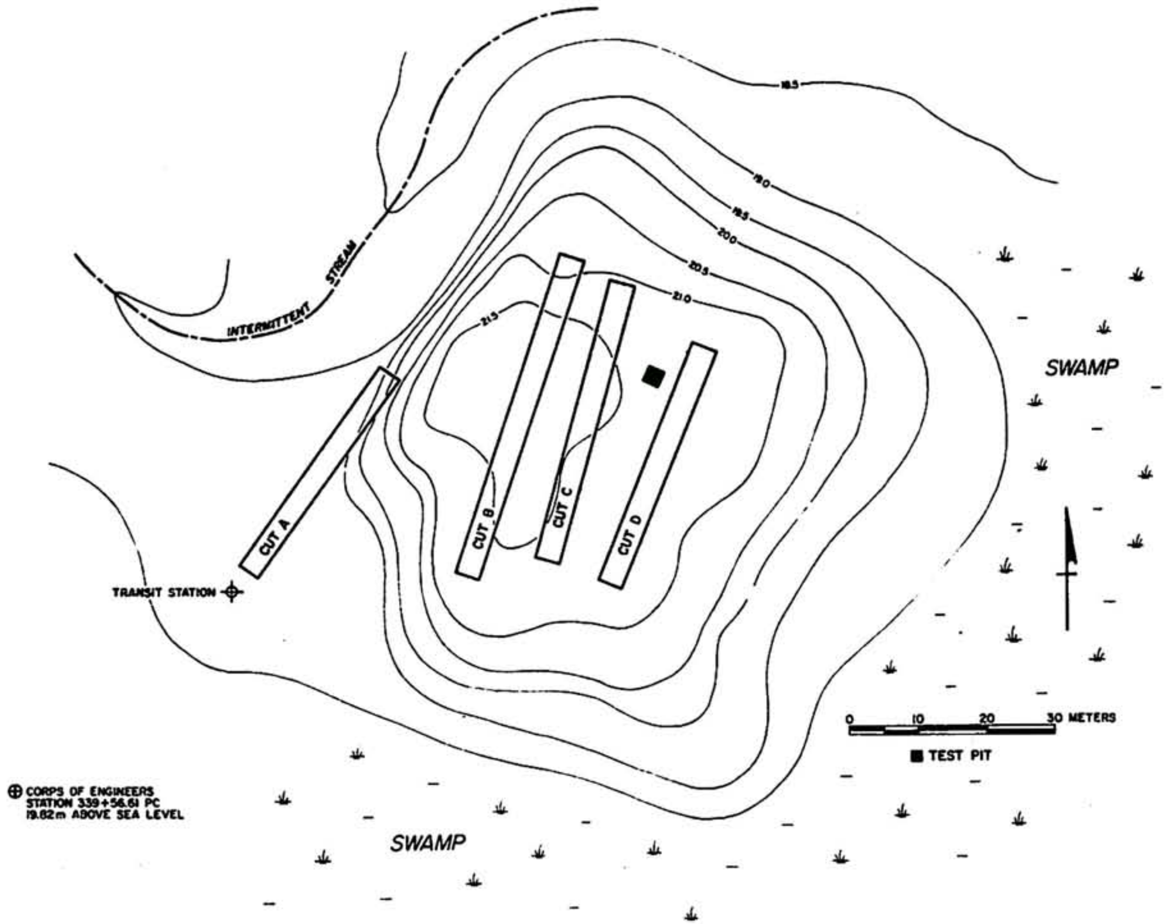

Figure A-1. Site 38BK239: Phase I, contour map showing locations of bulldozer Cuts A-D and subsurface testing unit (shaded).

Initially, after a heavy rain, the cuts were used as controlled surface collection units. No material was encountered in Cuts A and B, and no further work was undertaken in the western portion of the site. Surface collections indicated that material in Cut C was confined to the northern 10 meters of the cut. This area was shovel schnitted 5-10 centimeters deep into the naturally occurring B Soil Horizon (medium yellow-tan sand). All material was in the top 5 cm in the mottled, yellow-brown and gray sand (Soil Horizon A).

The entire artifact assemblage from Cut C consisted of 10 sand tempered, fabric impressed sherds and 1 sand tempered, undetermined decorated sherd. There were no artifact concentrations or features. Exposed artifacts were mapped and removed. Three 10-liter flotation samples were selectively obtained from the mottled yellow-brown and gray sand containing the artifacts.

Cut D, as indicated by surface collections, contained a few sparsely scattered sherds along the central 30 meters of the cut in the area of the east-west ridge running through the site. This area of the cut was shovel schnitted to a depth of 5 cm into the naturally occurring, medium yellow-brown sand. Shovel schnitting subsequently indicated that most of the material, sparse as it was, was located along the northern slope of the ridge in the top 10 cm of the B Soil Horizon (medium yellow-brown sand). The entire artifact assemblage from Cut D consisted of ceramic sherds (sand tempered plain [7], fabric impressed [4], cord marked [1], undetermined decorated [4]) and lithic debitage (metamorphic [1], orthoquartzite [1]).

One small cluster of 5 sherds and 1 orthoquartzite flake, designated as Feature 1, was discovered in Cut D during shovel schnitting at about 5 cm into the yellow-brown sand (Fig. A-2). There were no stains associated with the artifacts. Nevertheless, a 10-liter flotation sample was obtained from the feature.

A consideration of Cuts A-D indicated that the artifactual material at the site was "concentrated" in the area between the northern ends of Cuts C and D. Because the material appeared to be generally sparse, a unit larger than the standard 1 x 1 meter square was necessary, but excavating a number of units seemed unwarranted. A 2 x 2 meter excavation unit was considered optimal.

Stratification, as indicated by the 2 x 2 meter unit, consisted of a 5-cm deep, light gray, sandy humus zone (Soil Horizons O_1 and O_2). Soil Horizon A (5-15 cm) was characterized by a mottled-gray and yellow-brown fine sand, with some cemented sand concretions and bits of clay substrate "pulled-up" during cultivation (no plow scars were evident). Soil Horizon B (15-40 cm) consisted of yellow-brown fine sand. The amount of concretions and "pulled-up" clay substrate increased with depth. A red, sandy clay substrate was encountered at 40 cm below ground surface.

In the unlikely event, as indicated by Cuts A-D, that stratification was in part culturally (prehistorically) determined, the unit was excavated by stratigraphic levels. Each level was shovel schnitted in an attempt to locate features or artifact concentrations. With the exception of one

Figure A-2: Site 38BK239: Phase I, exposing Feature 1 in Cut D after discovery during shovel schnitting. View looking north.

Figure A-3: Site 38BK423: Ridgenoses of site in background and evidence of canal construction activities in foreground. View looking south.

10-liter flotation sample from each level, all soil was screened through one-quarter-inch mesh hardware cloth.

Artifacts consisted of 1 orthoquartzite flake from the base of Soil Horizon A (5-15 cm below ground surface) and several sherds and flakes (sand tempered plain [2], fabric impressed [6], orthoquartzite flakes [4]) from the top centimeters of Soil Horizon B (15-25 cm below ground surface). Although the artifacts in Soil Horizon B tended to occur in the northern one-half of the unit, there were no obvious concentrations or features.

38BK423

Site 38BK423 is located on three consecutive ridgenoses that slope downward, terminating at the edge of the Santee Swamp to the east (Figs. A-3, A-4). Because of extensive disturbance by natural processes and, in particular, that resulting from activities related to canal construction, the contextual integrity of site 38BK423 was lacking or minimal. Site 38BK423 was probably a part of site 38BK233, located by Brockington (1980) in the wooded area immediately upslope to the west. In order to prevent confusion, the area delineated by Interagency Archeological Services Division and the U. S. Army Corps of Engineers within the construction area was designated site 38BK423.

The undisturbed western portion of the site (38BK233) was characterized by well- to moderately well-drained soils of the Norfolk and Bonneau series (Charles B. Glover, Soil Conservation Service, personal communication; Berkeley County Soil Survey 1980). As typical of these soils, the vegetation included mixed hardwoods and long-leaf pine (Quarterman and Keever 1962). Presumably, the soils and vegetation at site 38BK423 were originally similar to site 38BK233.

A grid of square units 5 meters on a side was established over the site. This framework was utilized for conducting controlled surface collections 5 m^2 and for the systematic, nonrandom dispersal of 1 m^2 subsurface sample pits (Fig. A-4). The 1 m^2 units were excavated by shovel schnitting within 10-cm arbitrary levels or, if determinable during excavation, within natural levels. With the exception of 10-liter soil samples for flotation from all levels of selected units, all soil was screened through one-quarter-inch mesh hardware cloth.

The archeological materials recovered indicate a predominantly Woodland period cultural affiliation (cord marked, simple stamped, check stamped, and fabric impressed pottery). Small amounts of curvilinear and rectilinear complicated stamped ceramic sherds and unifacial lithic tools may indicate minimal Mississippian and Archaic period representation, respectively. No structures or other subsurface features were discovered at 38BK423.

Surface collections and subsurface testing indicated that archeological materials were sporadically present and most commonly occurred in low densities over the site area. The depth of deposits varied from ca. 10-80

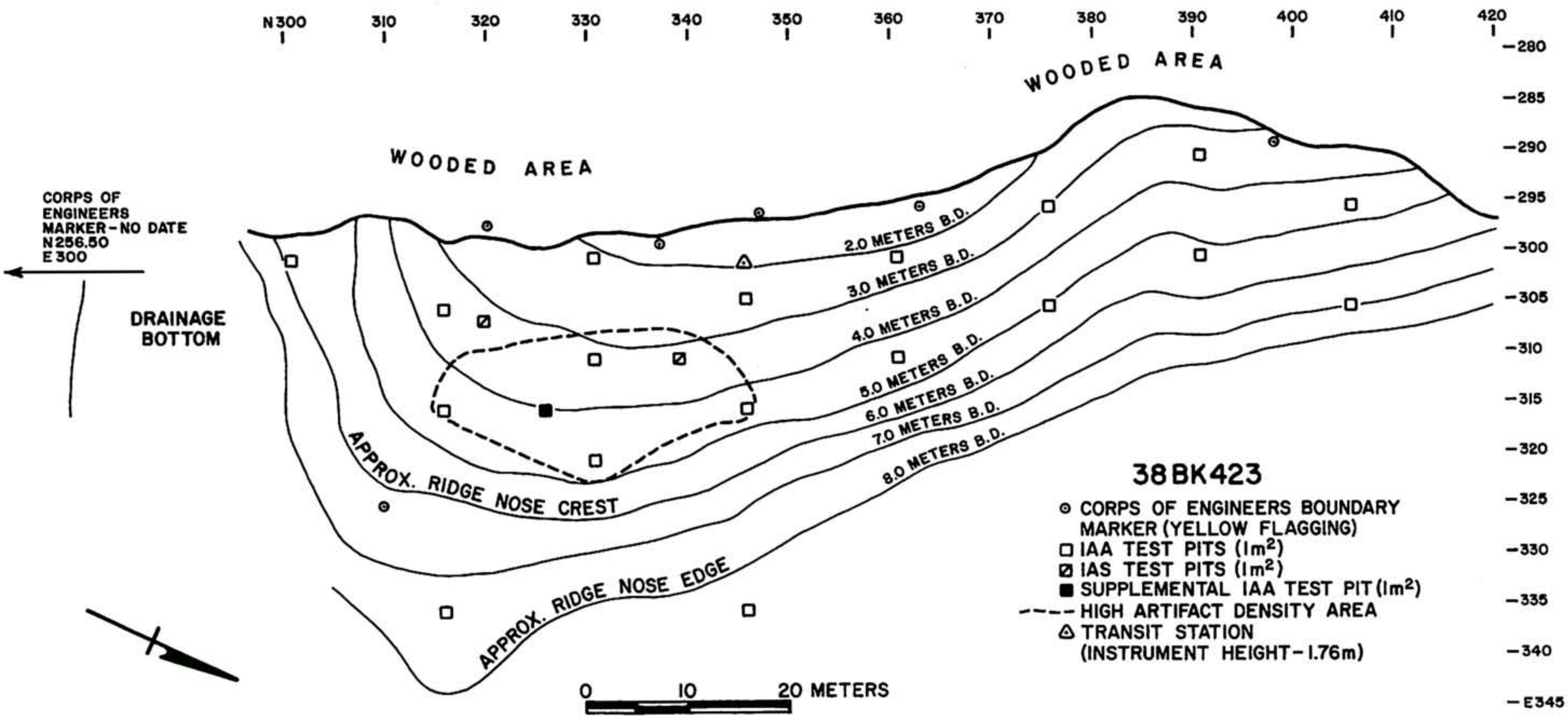

Figure A-4. Site 38BK243: Phase I, contour map showing locations of intensive testing units.

cm, resulting from differential amounts and degrees of slope wash, alluvial deposition, and modern construction activities. Hence, contextual integrity appears to be lacking or minimal.

Nevertheless, one area did contain stratified deposits up to 80 cm in depth and a noticeably higher density of archeological material than other areas of the site. Pottery from the two deepest excavation units in this area (330-331N, 310-311E; 330-331N, 320-321E) were seriated, using techniques described by Brainerd (1951), Gelfand (1971), Marquardt (1978), and Robinson (1951). This was done in an attempt to determine if this portion of the site had contextual integrity and, if so, to derive the cultural chronology. The results were ambiguous, suggesting that the archeological materials have undergone considerable vertical, and probably horizontal, spatial displacement.

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APPENDIX B

KEY TO CERAMIC CODE SHEET

*11. 1-3: Site number

235
236
239
423

* 1. 4: Phase

0) Unknown
1) Testing phase
2) Excavation phase
3) Surface collection March-July 1979
4) Surface collection after grading August 1979
5) Surface collection after rain August 1979

*11. 5-7: Grid location

N/S coordinate of SW corner of square

*11. 8-10: Grid location

E/W coordinate of SW corner of square

*11. 11-13: Absolute level of artifacts, if given

Number centimeters below datum point

*11. 14-16: Upper bound of level

Number centimeters below datum point

*11. 17-19: Lower bound of level

Number centimeters below datum point

* 1. 20: Rank

0) Unknown or not recorded
1) Surface or plow zone
2) Level A
3) Level B
4) Level C
5) Level D
6) Level E
7) Level F

* Astericks indicate information to be recorded for medium-sized sherds as well as for large and specialized sherds.

*11. 21-22: Main feature

See separate listing for feature designations

*11. 23-24: Subfeatures

See separate listing for designations

* 1. 25: Form 1

1) Rim
2) Neck
3) Shoulder
4) Base
5) Large body sherd (larger than 3 cm, or a half dollar, in one direction)
6) Medium-sized body sherd (larger than 2 cm, or a nickel, in one direction)

Count and weight of all sherds to be recorded on a separate card, as is the occurrence of any other ceramic objects. Sherds smaller than 3 cm in diameter will be counted and weighed only.

1. 26: Form 2

Same categories as Form 1: to be used in case of sherds exhibiting more than one vessel part. Vessel parts can be recorded in any order, so long as Form 1 is always filled in first, Form 2 second, and Form 3 last.

1. 27: Form 3

Same as Form 1 and Form 2. Use only when Forms 1 and 2 have already been filled in.

* 1. 28-29: Surface treatment 1

Surface treatment of Form 1: must correspond to the vessel part listed under Form 1.

01) Undetermined
02) Plain
03) Cord marked
04) Fabric impressed
05) Check stamped
06) Simple stamped
07) Curvilinear complicated stamped
08) Rectilinear complicated stamped
09) Incised
10) Bold incised
11) Punctate
12) Cob impressed
13) Applied fillet

Surface treatment 1 (Cont.)

14) Dentate stamped
15) Linear check stamped
16) Smoothed-over complicated stamped
17) Smoothed-over curvilinear comp. with incised rectilinear design
18) Cross simple stamped
19) Incised and punctate
20) Comp. stamp and punctate

11. 30-31: Surface treatment 2

Surface treatment of Form 2; categories same as Surface treatment 1.

11. 32-33: Surface treatment 3

Surface treatment of Form 3: categories same as Surface treatment 1 and 2.

* 1. 34: Exterior surface finish

1) Eroded or undetermined
2) Scraped with edged tool
3) Smoothed (compacted surface with no luster)
4) Polished (compacted lustrous surface)
5) Tool polished (tool marks)
6) Hand smoothed or unfinished
7) Scraped and smoothed
8) Slipped

* 1. 35: Interior surface finish

Same as exterior surface finish.

*11. 36-37: Ware type

01) Undetermined
02) Deptford
03) Thom's Creek
04) Wilmington
05) Cape Fear
06) Refuge
07) York
08) Savannah
09) Undetermined Mississippian
10) Irene
11) Stallings
12) Undetermined Woodland

* 1. 38: Temper type

1) Quartz
2) Grog
3) Fiber
4) Limestone
5) Shell

* 1. 39: Temper size

1) Silt (< 1/16 mm)
2) Very fine (1/16-1/8 mm)
3) Fine (1/8-1/4 mm)
4) Medium (1/4-1/2 mm)
5) Coarse (1/2-1 mm)
6) Very coarse (1-2 mm)
7) Granules (2-4 mm)

1. 40: Exterior color (Munsell System)

1) Red or orange (5YR 2/2, 5YR 4/2, 5YR 3/4, 5YR 5/4, 5YR 2/6, 5YR 4/6, 10YR 2/2, 10YR 3/4, 10YR 5/4, 10YR 4/6, 10YR 6/6
2) Black (N/1, N/2)
3) Gray (N/3, N/4, N/5, N/6, N/7)
4) Brown (5YR 2/2, 5YR 3/2, 5YR 5/2, 5YR 3/4, 5YR 4/4, 5YR 6/4, 5YR 5/6, 10YR 2/2, 10YR 4/2, 10YR 5/4)
5) Buff and Pink (5YR 7/2, 5YR 8/2, 5YR 8/4, 10YR 6/2, 10YR 8/2)
6) Yellow (10YR 7/4, 10YR 6/6, 10YR 8/6)

1. 41: Core Color

Categories same as exterior color.

*11. 42-43: Thickness

Continuous measurement in millimeters.

11. 44-45: Hardness

11. 46-48: Orifice diameter

Continuous measurement in millimeters. Reliable only for sherds over 3 cm.

11. 49-51: Vertical radius

Continuous measurement in mm. Where vertical and horizontal orientations are known (as in rim sherds or coil breaks), record perpendicular measures in appropriate columns; otherwise, the two measurements are interchangeable. Reliable only for sherds larger than 5 cm. Measurements must be per pendicular; if sherd is 5 cm wide in one direction only, take only one measurement.

11. 52-54: <u>Horizontal radius</u>

Continuous measurement in mm.

11. 55-56: <u>Lip form</u>

01) Rounded
02) Flattened
03) Beveled in
04) Beveled out
05) Simple stamped
06) Cord marked = flattened (see comments)
07)
08)

1. 57: <u>Specialized rim forms</u>

1) Collared
2) Folded
3) Thickened
4) Tapered
5) Applied
6) Flanged
7) Scalloped

11. 58-59: <u>Rim profile</u>

01) Greatly everted
02) Everted
03) Slightly everted
04) Straight
05) Small bowl
06) Inverted

1. 60: <u>Neck form</u>

1) Simple restricted
2) Elongate
3) Undetermined

1. 61: <u>Shoulder form</u>

1) Rounded
2) Angled

1. 62: <u>Base form</u>

1) Rounded
2) Flattened
3) Conical
4) Tetrapodal

*1. 63: <u>Coil breaks</u>

1) Present
2) Absent

* <u>Comments section</u>

1) Spalling
2) Repair holes
3) Suspension holes
4) Interior residues
5) Exterior charring
6) Mineral inclusions
7) Crushed temper

APPENDIX C

LITHIC DATA CODE FORMS AND GLOSSARY

HAFTED BIFACES/OTHER BIFACES

1) Site Number

235 38BK235	239 38BK239
236 38BK236	423 38BK423

2) Phase

0 Unknown/not expressed
1 Testing phase
2 Excavation phase
3 Collection from March-July, 1979
4 Collection after grading, August, 1979
5 Collection after hurricane/rain, August, 1979

3) Square (grid location)

N/S E/W
Expressed in terms of actual square designation
(SW corner)

4) Level

Absolute
Lower bound
Upper bound
Rank

0	Unknown/not expressed	4	Level C
1	Surface/"plow zone"	5	Level D
2	Level A	6	Level E
3	Level B	7	Level F

5) Feature

Main Subfeature
(See separate listing of feature designations)

6) Type Artifact

00 Unknown (due to incompleteness of artifact)

Notched		Stemmed	
01	Hardaway side-notched	21	Kirk stemmed
02	Taylor	22	Stanly
03	Palmer	23	Morrow Mountain I
04	Kirk corner-notched	24	Morrow Mountain II
05	Bifurcated base (Lecroy, Knanwha)	25	Gary
06	Unknown side-notched	26	Savannah River
07	Unknown corner-notched	27	Swannanoa
08	Unknown basal-notched	28	Otarre
09-19	AS NEEDED	29	Rossville
		30	Unknown stemmed
		31-39	AS NEEDED

Unstemmed		Other Bifaces	
41	Guilford	61	Blank/quarry blade
42	Duncan-Hanna	62	Preform
43	Badin	63	Perforator/drill
44	Yadkin	64	Flesher
45	Uwharrie	65	Axe (chipped)
46	Caraway	66	Celt (chipped)
47	Pee Dee (Pentagonal)	67	Adz (chipped)
48	Unknown triangular	68	Chopper/cleaver
49-59	AS NEEDED	69	Nonhafted cutting tool
		70	Nonhafted end tool
		71	Unknown biface tool
		72	Unknown biface
		73	Hafted cutting tool
		74	Bifacially worked artifact/unfinished biface
		75-99	AS NEEDED

7) Morphology

0	Not applicable	4	Ovate-triangular
1	Amorphous	5	Lanceolate
2	Ovate	6	Spheroidal
3	Triangular	7	"Squared"
		8	"Rectangular"
		9	Indeterminate

8) Raw Material

00 Unknown
01 Orthoquartzite
02 Chert, coastal plain
03 Chert, Ridge & Valley
04 Chert, other
05 Rhyolite, flow
06 Rhyolite, porphyritic
07 Rhyolite, other
08 Tuff, welded
09 Tuff, felsic
10 Tuff, other
11 Argillite
12 Quartz, vein
13 Quartz, crystal
14 Other igneous
15 Other metamorphic
16-99 AS NEEDED

9) Condition

0 Indeterminate - other
1 Whole
2 Distal section only
3 Distal section and midsection
4 Midsection only
5 Proximal section only
6 Proximal and midsections
7 Basal/hafting element only
8 Lateral edge only
9 Lateral edge and mid-section

10) Break

0 Unknown
1 Recent
2 Manufacturing
3 Use
4 Impact fracture

11) Maximum length (in millimeters)

12) Maximum width (in millimeters)

13) Maximum thickness (in millimeters)

14) Number of use edges

0 None
1 1
2 2
3 3

15) Use edge morphology

0 Indeterminate
1 Straight
2 Excurvate
3 Incurvate
4 Irregular
5 Tip, acute
6 Tip, Obtuse
7 Combination of above (specify in comments)
8-9 AS NEEDED

16) <u>Edge angle (in degrees)</u>

00	Indeterminate
01-98	1° - 98°
99	99 and over

17) <u>Type wear</u>

00	None
01	Indeterminate
02	Nibbling, light
03	Nibbling, medium
04	Nibbling, heavy
05	Crushing, light
06	Crushing, medium
07	Crushing, heavy
08	Edge deterioration, light
09	Edge deterioration, medium
10	Edge deterioration, heavy
11	Smoothing, light
12	Smoothing, medium
13	Smoothing, heavy
14	Polishing, light
15	Polishing, medium
16	Polishing, heavy
17	Silica sheen
18	Edge striations, parallel
19	Edge striations, 0° - 90°
20	Edge striations, irregular
21	Combinations of above (specify in comments)

18) <u>Location surface of wear</u>

0	Indeterminate
1	Present dorsal surface
2	Present ventral surface
3	Present single surface
4	Present both surfaces

19) <u>Resharpened</u>

1	Absent
2	Present

20) <u>Maximum haft element length (in millimeters)</u>

21) <u>Maximum haft element width (in millimeters)</u>

FLAKE TOOLS

1) Site Number

235	38BK235	239	38BK239
236	38BK236	423	38BK423

2) Phase

0 Unknown/not expressed
1 Testing phase
2 Excavation phase
3 Collection from March-July, 1979
4 Collection after grading, August, 1979
5 Collection after hurricane/rain, August 1979

3) Square (grid location)

N/S E/W
Expressed in terms of actual square designation
(SW corner)

4) Level

Absolute
Lower bound
Upper bound
Rank

0	Unknown/not expressed	4	Level C
1	Surface/"plow zone"	5	Level D
2	Level A	6	Level E
3	Level B	7	Level F

5) Feature

Main Subfeature
(see separate listing of feature designations)

6) Type Artifact

00	Unknown (due to incompleteness)	06	Denticulate
01	Scraper, side	07	Spokeshave
02	Scraper, end	08	Burin
03	Scraper, other	09	Utilized flake
04	Perforator	10-99	AS NEEDED
05	Spur/graver		

7) Flake type

0 Unknown/indeterminate
1 Primary
2 Secondary
3 Tertiary (internal)
5 Biface thinning flakes and flakes of bifacial retouch
6 "Chunks"
8 Broken flake
9 Other

8) Raw Material

00 Unknown
01 Orthoquartzite
02 Chert, coastal plain
03 Chert, Ridge & Valley
04 Chert, other
05 Rhyolite, flow
06 Rhyolite, porphyritic
07 Rhyolite, other
08 Tuff, welded
09 Tuff, felsic
10 Tuff, other
11 Argilite
12 Quartz, vein
13 Quartz, crystal
14 Other igneous
15 Other metamorphic
16-99 AS NEEDED

9) Condition

0 Indeterminate
1 Whole
2 Distal section only
3 Midsection only
4 Proximal section only
5 Basal/hafting element only
6 Lateral edge only
7 Flake fragment
8 Combinations of above (specify in comments)

10) Break

0 Unknown
1 Recent
2 Manufacturing
3 Use

11) Flake area

1	I	0-100mm^2	4	IV	401-625mm^2	7	VII	1226-1600mm^2
2	II	101-225mm^2	5	V	626-900mm^2	8	VIII	1601-2025mm^2
3	III	226-400mm^2	6	VI	901-1225mm^2	9	IX	2026-+

12) Number use edges

0 None
1 1
2 2
3 3
4 4
5 5

13) Use edge morphology

0	Indeterminate	4	Irregular
1	Straight	5	Tip-Acute
2	Excurvate	6	Tip-Obtuse
3	Incurvate	7-9	AS NEEDED

14) Edge angle (in degrees)

00	Indeterminate
01-98	1°-98°
99	99° and over

15) Type wear

00	None	11	Smoothing, light
01	Indeterminate	12	Smoothing, medium
02	Nibbling, light	13	Smoothing, heavy
03	Nibbling, medium	14	Polishing, light
04	Nibbling, heavy	15	Polishing, medium
05	Crushing, light	16	Polishing, heavy
06	Crushing, medium	17	Silica sheen
07	Crushing, heavy	18	Edge striations, parallel
08	Edge deterioration, light	19	Edge striations, 0°-90°
09	Edge deterioration, medium	20	Edge striations, irregular
10	Edge deterioration, heavy	21	Combinations of above (specify in comments)

16) Location surface wear

0	Indeterminate	3	Present both surface
1	Present dorsal surface	4	Present single surface
2	Present ventral surface		

17) Resharpened

1	Absent	2	Present

CORES

1) Site Number

235 38BK235	239 38BK239
236 38BK236	423 38BK423

2) Phase

0 Unknown/not expressed
1 Testing phase
2 Excavation phase
3 Collection from March-July, 1979
4 Collection after grading, August, 1979
5 Collection after hurricane/rain, August, 1979

3) Square (grid location)

N/S E/W
Expressed in terms of actual square designation
(SW corner)

4) Level

Absolute
Lower bound
Upper bound
Rank

0	Unknown/not expressed	4	Level C
1	Surface/"plow zone"	5	Level D
2	Level A	6	Level E
3	Level B	7	Level F

5) Feature

Main Subfeature
(See separate listing of feature designations)

6) Core type

0	Unknown/indeterminate	3	Multifacial
1	Unifacial	4	Other (specify in comments)
2	Bifacial	5-9	AS NEEDED

7) Raw Material

00	Unknown	09	Tuff, felsic
01	Orthoquartzite	10	Tuff, other
02	Chert, coastal plain	11	Argillite
03	Chert, Ridge and Valley	12	Quartz, vein
04	Chert, other	13	Quartz, crystal
05	Rhyolite, flow	14	Other igneous
06	Rhyolite, porphyritic	15	Other metamorphic
07	Rhyolite, other	16-99	AS NEEDED
08	Tuff, welded		

8) Condition

0	Indeterminate	4	Whole, exhausted
1	Whole	5	Broken, exhausted
2	Broken	6	Combination of more than one above (specify in comments)
3	Exhausted		

9) Break

0	Unknown	2	Manufacturing
1	Recent	3	Use

10) Cortex

1	Absent	2	Present

11) Weight

Expressed in grams

12) Number of Flakes

0	Indeterminate	4	4	8	8-13
1	1	5	5	9	14-over
2	2	6	6		
3	3	7	7		

13) Type flakes removed

0	Unknown	4	"chunks"
1	Primary	5	Other (specify in comments)
2	Secondary	6-9	AS NEEDED
3	Tertiary (internal)		

14) Average flake area (of flakes removed)

0	Indeterminate/not applicable	5	V 626-900mm^2
1	I 0-100mm^2	6	VI 901-1225mm^2
2	II 101-225mm^2	7	VII 1226-1600mm^2
3	III 226-400mm^2	8	VIII 1601-2025mm^2
4	IV 401-625mm^2	9	IX 2026-+

15) Number use edges/facets

1	1 edge	6	2 facets
2	2 edges	7	3 facets
3	3 edges	8	4 facets
4	4 edges	9	Combinations of above (specify in comments)
5	1 facet		

16) Edge/facet morphology

1	Straight		6	Obtuse	
2	Excurvate	Edge	7	Acute	Facet
3	Incurvate	Morphology	8	Rounded	Morphology
4	Irregular		9	AS NEEDED	
5	AS NEEDED				

17) Edge/facet angle

00 Indeterminate 01-98 1^{o}-98^{o} 99 99^{o} and over

18) Type wear

00	None	11	Smoothing, light
01	Indeterminate	12	Smoothing, medium
02	Nibbling, light	13	Smoothing, heavy
03	Nibbling, medium	14	Polishing, light
04	Nibbling, heavy	15	Polishing, medium
05	Crushing, light	16	Polishing, heavy
06	Crushing, medium	17	"Grinding", light
07	Crushing, heavy	18	"Grinding", medium
08	Edge deterioration, light	19	"Grinding", heavy
09	Edge deterioration, medium	20	Combination of above (specify in comments)
10	Edge deterioration, heavy		

19) Location surface of wear

0	Indeterminate	3	Present both surfaces
1	Present dorsal surface	4	Present single surface
2	Present ventral surface		

20) Resharpened

1	Absent	2	Present

DEBITAGE

1) Site Number

235 38BK235	239 38BK239
236 38BK236	423 38BK423

2) Phase

0 Unknown/not expressed
1 Testing phase
2 Excavation phase
3 Collection from March-July, 1979
4 Collection after grading, August, 1979
5 Collection after hurricane/rain, August, 1979

3) Square (grid location)

N/S E/W
Expressed in terms of actual square designation
(SW corner)

4) Level

Absolute
Lower bound
Upper bound
Rank

0	Unknown/not expressed	4	Level C
1	Surface/"plow zone"	5	Level D
2	Level A	6	Level E
3	Level B	7	Level F

5) Feature

Main Subfeature
(See separate listing of feature designations)

7) Raw Material

00	Unknown	09	Tuff, felsic
01	Orthoquartzite	10	Tuff, other
02	Chert, coastal plain	11	Argillite
03	Chert, Ridge and Valley	12	Quartz, vein
04	Chert, other	13	Quartz, crystal
05	Rhyolite, flow	14	Other igneous
06	Rhyolite, porphyritic	15	Other metamorphic
07	Rhyolite, other	16-99	AS NEEDED
08	Tuff, welded		

8) Flake size/area

1 I 0-100 mm^2 2 II 101-900 mm^2 3 III 901 mm^2 -+

9) Flake type

0 Unknown
1 Primary
2 Secondary
3 Tertiary (internal)
5 Biface thinning flakes and flakes of bifacial retouch
6 Chunk
7 "Shatter"
8-9 AS NEEDED

10) Number

Actual count

GLOSSARY

Artifact Types

Hafted Bifaces/Other Bifaces

01	Hardaway Side-Notched:	(Coe 1964: 67)
02	Taylor:	(Michie 1966: 123)
03	Palmer:	(Coe 1964: 67)
04	Kirk Corner-Notched:	(Coe 1964: 70)
05	Bifurcated Base (Lecroy, Kanawha):	(Lewis and Kneberg 1955: 79, 81; Broyles 1971: 69, 59)
06	Unknown Side-Notched:	Any unknown or unidentifiable side-notched biface
07	Unknown Corner-Notched:	Any unknown or unidentifiable corner-notched biface
08	Unknown Basal-Notched:	Any unknown or unidentifiable basally-notched biface
21	Kirk Stemmed:	(Coe 1964: 70)
22	Stanly:	(Coe 1964: 35)
23	Santee Stemmed:	Santee Stemmed is a small, diminutive stemmed biface. It is triangular in overall shape, having an average length of 28-30 mm, width of 20 mm and average thickness of 6-9 mm. The "stem" is normally very short (4-7 mm) and on some specimen appears almost incidental, i.e., the result of basal notching. The entire sample from the Santee River area was manufactured of orthoquartzite and exhibited rather crude workmanship. Technique of manufacture seems to have been primarily hard hammer percussion with only a few specimens showing possible percussion finishing retouch. The name "Santee Stemmed" has been suggested by David G. Anderson.
24	Morrow Mountain II:	(Coe 1964: 37)
25	Gary:	(Suhm, Krieger, and Jelks 1954: 430)
26	Savannah River:	(Coe 1964: 44)
27	Swannanoa:	(Keel 1976: 196)
28	Otarre	(Keel 1976: 194)
29	Rossville:	(Ritchie 1961: 46)
30	Unknown Stemmed:	Any unknown or unidentifiable stemmed biface
41	Guilford:	(Coe 1964: 43)
42	Duncan/Hanna:	(Taylor and Smith 1978: 262, 263; Cooper 1974; Taylor and Smith acknowledge the name is misleading but point out the similarities in morphology and technology between the original type and those found in the Carolina Piedmont.)

43	Badin:	(Coe 1964: 45)
44	Yadkin:	(Coe 1964: 45-46)
45	Uwharrie	(Coe 1964: 49, 121)
46	Caraway:	(Coe 1964: 49)
47	Pee Dee:	(Coe 1964: 49)
48	Unknown Triangular:	Any unknown or unidentifiable triangular biface
61	Blank/quarry blade:	Bifacially retouched pieces that are crude in form, usually lacking regularity and/or symmetry. They are assumed to be initial manufacturing stages of the biface industry. They may be used as tools (see also Crabtree 1972: 42).
62	Preform:	Bifacially worked pieces that show both symmetry and regularity and can have even, lateral edges. These artifacts are considered to represent near-final stage in the biface manufacturing sequence (see also Crabtree 1972: 85).
63	Perforator/drill:	Bifacially manufactured implements with a long, narrow needle-like blade or tip used for perforating certain materials (leather, soapstone, etc). It may or may not be hafted.
64	Flesher:	Bifacially made implement, usually hafted, with a semi-circular or semi-lunate working edge.
65	Axe (chipped):	A bifacially manufactured, rectangular-to-oval shaped, usually fairly large implement used in heavy duty chopping or cutting. The midsection is occasionally constricted and may show haft wear (see Coe 1964: 113).
66	Celt (chipped):	A bifacially manufactured, rectangular-to-oval shaped, usually thin and well-made tool; occasionally slightly "bowl-shaped" at proximal end (with edge on profile).
67	Adze (chipped):	A bifacially manufactured, usually rectangular or squared, stone implement often hafted on an L-shaped handle. The edges are many times arched in distal end profile.
68	Chopper/cleaver:	A massive largely bifacially manufactured, poorly made chopping tool often quite similar to Old World chopper tools.
69	Nonhafted cutting tool:	Any bifacially made tool showing use/wear associated with cutting but because of its shape, thickness, etc., show no indication of having been hafted.

70 Nonhafted end tool: Any unifacially or bifacially made implement having a fairly narrow, rounded working edge or "end" which, because of its shape, thickness, etc., shows no indication of having been hafted.

71 Unknown biface tool: Any bifacially retouched implement or portion of an implement showing use/wear, but because of the nature or condition of the tool cannot be positively identified.

72 Unknown biface: A catch-all category used to refer to any biface that, because of its appearance, condition, and lack of use/wear indication, could not be positively identified. A major percentage of artifacts classified in this category were broken or damaged.

73 Hafted cutting tools: A bifacially manufactured, usually lanceolate in shape, and fairly thin in cross-section, cutting tool. It has a definite hafting facet yet is nondiagnostic in terms of "cultural affiliation."

74 Bifacially worked artifact/unfinished biface: Any lithic specimen exhibiting bifacial flaking and indicating attempts at shaping.

<u>Flake Tools</u>

01 Scraper, side: A unifacially made scraping tool, usually lanceolate or elongated in shape, although it may be large, bulky, oval or rectangular in shape (see Coe 1964: 77).

02 Scraper, end: Any number of unifacially made scraping tools either tear-drop, oval or lamellar in shape and having a fairly small, slightly-to-strongly excurvate scraping edge; usually well-made throughout all time periods.

03 Scraper, other: Any other unifacially made scraping tool.

04 Perforator: A unifacially made, often bifacially retouched tool having a long, narrow, sharp needle-like point used to punch or drill.

05 Spur/graver: A unifacially manufactured tool exhibiting a short, sharp, usually well-backed spur or tang.

06 Denticulate: Usually a unifacially manufactured tool with an irregular working edge retouched to isolate a number of sharp points or "teeth."

07 Spokeshave: A unifacially made tool consisting of a small-to-medium U-shaped scraping facet used in shaping shafts or dowel-shaped objects such as handles, needles, etc.

08 Burin: A distinctively manufactured tool, formed by blows which isolate a near 90° angle on a tool edge with a "backed ridge" to add strength.

09 Utilized flake: Any flake exhibiting use/wear on one or more of its edges. Utilized flakes may or may not be retouched, and may show unifacial or bifacial use, wear, and retouch flaking. They are expediently made, multifunctional tools.

Raw Material

01 Orthoquartzite: (see Chapter 5)

02 Chert, Coastal Plain: (see Cooke 1936; Anderson, Lee and Parler 1979)

03 Chert, Ridge and Valley: (Goodyear, House, and Ackerly 1979: 185)

04 Chert, other: Any chert not readily identifiable as either Ridge and Valley or Coastal Plain chert. It would include the category sometimes called Piedmont silicates.

05 Rhyolite, flow: A light-to-medium grey, banded with darker gray-to-black bands, lithic material. It breaks with a fine conchoidal fracture and may show light quartz porphyry.

06 Rhyolite, porphyritic: A light-to-medium gray (battleship), fine-grained lithic material which occasionally exhibits light flow banding. The phenocrysts are predominantly quartz (though sometimes feldspar) and vary from light to heavy concentrates.

07 Rhyolite, other: Any other lightly banded fine-grained raw material of probable volcanic (flow) origin.

08 Tuff, welded: A light gray-greenish, gray-to-green, extremely fine-grained, highly silicious material. Welded tuff, which breaks with a very fine conchoidal fracture, may be indistinguishable from chert.

09	Tuff, felsic:	Light gray, fine-to-medium grained raw material with inclusions (phenocrysts) of predominantly feldspar (rarely quartz); medium-to-good fracturing quality.
10	Tuff, other:	All other material probably derived from volcanic ash fall. Common in this category is the differentially crystallized tuff which is dark gray-blue-to-black in color and contains zones of lighter color usually circular or amygdaloid in shape. It is a fine-quality material.
11	Argillite:	A variable "grade" lithic raw material depending on the amount of silica contained. It can have a very "slaty" cleavage showing definite (sorted) sediment banding. Tuffaceous argillite is usually higher in silica and less angular in cleavage.
12	Quartz, vein:	(House and Wogaman 1978: 53).
13	Quartz, crystal:	(Novick 1978)
14	Other igneous:	(see House and Wogaman 1978; Novick 1978)
15	Other metamorphic:	(see House and Wogaman 1978; Novick 1978)

Type of Wear

Nibbling (light, medium, heavy): Nibbling is defined as fine, concoidal flakes and/or retouch removed along the use edge of a utilized implement.

Crushing (light, medium, heavy): Crushing is defined as the occurrence of hinge- and step-fracture damage as well as edge breakage and/or removal observed along the use edge of a tool.

Edge deterioration (light, medium, heavy): Edge deterioration is defined specifically for the Cooper River Project lithic assemblage. Edge deterioration refers to the type of attrition that occurs in "grainy," poorly silicified raw material such as the orthoquartzite and/or silicified sandstone from the project area. The individual grains comprising the material break down and, becoming mixed with the material being worked (wood, bone, etc.), produce a "sandpaper" effect that smooths and wears down the use edge. This in turn exposes the artifact edge to more severe weathering. This weathering, as well as the above described use edge destruction is, then, termed edge deterioration.

Smoothing (light, medium, heavy): Smoothing is defined as a form of edge attrition somewhat similar to edge deterioration, though much less drastic. A smoothed edge is characterized by removal of protrusions and angular grains of material, and by a sandpaper-like finishing.

Polishing (light, medium, heavy): Polishing is defined as very light wear inflicted on a tool edge via the working of a fairly soft material such as hide, leather, etc. Polishing often gives the use edge a glossy, shiny appearance.

Silica sheen: Silica sheen is defined as an extremely fine, microscopic polishing resulting from the working or processing of grasses and vegetal matter. Silica sheen may be observed only on tool edges manufactured with extremely fine-quality lithic raw material.

Edge striations (parallel), 0° - 90°, irregular): Edge striations were defined as scratches or etched lines along the use edge of a stone tool. They often appear several millimeters inward from the working edge. Sand or silica particles often etch these striations.

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LIST OF DATA SUPPLEMENTS AND NOTES ON CURATION

The following data supplements are on file, both at the Institute of Archeology and Anthropology, University of South Carolina, Columbia, and at the National Park Service, Southeast Regional Office, Atlanta:

Data Supplement I:	Analysis of Botanical Remains from the Cooper River Rediversion Project (Deborah M. Pearsall and Eric E. Voigt)
Data Supplement II:	A Report on the Osteological Remains from the Cooper River Rediversion Project (Sarah W. Neusius)
Data Supplement III:	Geology of the Archeological Sites near St. Stephens, Berkeley County, South Carolina (Donald J. Colquhoun)
Data Supplement IV:	Report on Pollen Analyses of Sediment Samples from Cooper River Rediversion Project (Michael J. Andrejko)
Data Supplement V:	Report on Results of Chemical Analysis and Particle Size Analysis of Soil Samples from Site 38BK235, Cooper River Rediversion Project (Alf Sjoberg)
Data Supplement VI:	Ceramic Data from the Cooper River Rediversion Project (Helen W. Haskell and JoLee A. Pearson)
Data Supplement VII:	Lithic Data from the Cooper River Rediversion Project (Keith M. Derting)

All animal and plant remains are permanently curated at the Institute of Archeology and Anthropology, as are all artifacts, field notes, photographs, maps, and other documents. Also on file at the Institute are the thin sections from the petrographic analysis, the fired clay sample tiles, and the plots from the X-ray diffraction analysis performed by Pearson. The computer printouts of frequencies and cross-tabulations for Data Supplements VI and VII are filed under separate cover at the Institute of Archeology and Anthropology and at the National Park Service, Southeast Regional Office, Atlanta, and on computer tape in the Tape Library, University of South Carolina Computing Center.